

THE

# MEDICAL REPOSITORY.

VOL. II.—No. IV.

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# MEDICAL REPOSITORY.

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## ADVERTISEMENT.

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**T**HIS Number completes the second volume of the MEDICAL REPOSITORY. Owing to the increasing demand for the work, the numbers of the first impression of the first volume have become scarce. It is, therefore, in contemplation to reprint them, that purchasers may be accommodated with entire sets. The second volume can be had complete, either bound or in separate numbers, at the store of the publishers, No. 99 Pearl-street, New-York. The readers of the MEDICAL REPOSITORY may rest assured, that the editors will spare no pains to make the succeeding numbers worthy of their perusal. They are sorry to learn, that some parcels did not arrive at their places of destination, particularly in Massachusetts and Georgia, in due season. These delays did not arise from any neglect on their part, but were owing entirely to way-faring accidents. Their friends may rely on their care, to prevent, as much as possible, the like for the future.

*New-York, May 2, 1799.*





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# MEDICAL REPOSITORY.

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VOL. II.—No. IV.

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## ARTICLE I.

### MEDICAL ESSAYS.—No. III.

*On the PESTILENTIAL DISEASES which, at different times, appeared in the Athenian, Carthaginian, Carthaginian and Roman Armies, in the neighbourhood of Syracuse.*

*By the late E. H. SMITH, Physician.*

**S**YRACUSE, the most beautiful of all the cities built by the Greeks, was founded by Archias, a Corinthian, of the race of Hercules.\* He first expelled the natives from Ortygia, where he commenced the city, which was afterwards extended to the neighbouring continent. This place, so celebrated in ancient history, the birth-place of Archimedes, and theatre of many memorable transactions, now reduced to a miserable town, of inferior consequence even in Sicily, is situated in north latitude  $37^{\circ} 5'$ , a little above Cape Passara (the ancient Pachynum), the southwestern extremity of the island of Sicily.

The climate of Sicily, in general, is represented as favourable to health;† and, notwithstanding its insular situation, more analogous, in the qualities of temperature and humidity, to the hilly than to the atlantic divisions of South-Carolina and Georgia. The winter is remarkably mild. With the exception of a few days, it equals the finest spring weather in the north of Europe‡ and the eastern states of America; and the shade is found pleasant, in the middle of the day, even in the month of January.§ At Syracuse, in particular, the season is so little affected by the

\* Cicero in Ver. act. II. lib. iv. § 117. Thucydides, B. vi.

† Eeigne Berichten, &c. i. &c. Some account of the Prussian, Austrian, and Sicilian monarchies, &c. See Monthly Review Enlarged, vol. xiv. p. 491.

‡ Swinburne's Travels in the two Sicilies, vol. ii. § 49. Dublin edit.

§ Keyfler's Travels, vol. iii. p. 33.—Translation.

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severities of cold and tempest, that, during its whole course, and in its most boisterous state, the sky is never totally obscured for a single day.\* Yet, in this climate, did Verres, the voluptuous prætor of Sicily, that monster of atrocity and lasciviousness, so entirely seclude himself from all impact and influence of the atmosphere, as only to learn the approach of spring by observing the dew glisten on the verdure which surrounded his palace.† As the season advances, the heat rapidly increases, till, in the summer, it is no longer to be endured by strangers, and exertion, as well as enjoyment, is temporarily suspended. In autumn, the frequent rains, which are common throughout this season, and the heats of the middle of the day, contrasted with the extreme chilliness of the evenings, render it less pleasant and salubrious than any other part of the year.‡ It is to the excessive sultriness of the summers, that a late sensible writer§ ascribes the imperfection of many, and the total want of others, of the most nutritious and refreshing vegetables of the northern climates, in despite of that fertility of soil which, from time immemorial, has conferred on Sicily the appellation of the granary of Europe.

But, notwithstanding the general pleasantness and healthfulness of this island, the concurrent testimony of ancient and modern writers evinces the noxious condition of particular places. "The least stagnant water is sufficient, in the heats of summer, to poison the atmosphere: its effects on the countenances of the poor people, who live in its vicinity, are very evident; and a stranger, who travels through the island in this season, ought to avoid ever passing a night near them."|| "As soon as the sun enters the Lion, this country becomes the house of death: fevers, of the most malignant kind, seize upon the imprudent or unfortunate wretch that spends a night near them (ponds and marshes); and few escape with life, when attacked by so virulent a disorder."¶ Instructed, probably, by experience of the calamities consequent on a near residence to marshes and stagnant waters, the inhabitants, in various parts of Sicily, have built their towns on adjoining eminences.\*\* To avoid the dangers which

\* Cicero in Ver. act. II. lib. v. § 26.

† Cicero in Ver. act. II. lib. v. § 12.

‡ Travels in Sicily and Malta, by M. de Non, p. 307, 333, and 383.—Translation.

§ Eenige Berichten, &c.—"The soil is exceedingly fertile; but, from the great heat of the climate, many of our most nourishing and refreshing vegetables will not thrive in it. Currants, raspberries, and gooseberries, are unknown to the natives; and foreigners, who have attempted to cultivate them, have never been able to succeed."

|| Eenige Berichten, &c.

¶ Swinburne's Travels, vol. ii. § 49. Dublin edit.

\*\* Swinburne's Travels, vol. ii. p. 300. Dublin edit.

beset the stranger in journeying through this country in the sultry and autumnal seasons, was probably one of the motives of the Roman prætors for performing the tour of the island in the time of harvest.\* By a neglect of similar prudence, the celebrated M. de Non became affected with a violent fever and ague, after an incautious exposure to the heat of the sun and the chill of the evening, in an unwholesome part of the country, and in the month of September.†

From this brief account of the climate of Sicily, it will be evident, that, how favourable soever it may be esteemed, in general, to the health and longevity of the natives, and how pleasant soever many parts of it deserve to be considered, as a winter and even vernal residence for strangers; yet, in other seasons, and particularly for visitors from colder countries, it must be, in most parts, unsalutary, in others certainly fatal, and, in some, not to be long continued in, with impunity, by the inhabitants themselves. And, as this remark refers wholly to ordinary years and circumstances, it will afford some ground for estimating the effects of one of the most unhealthy situations in the country, in the sickly season of the year, with a constitution of the atmosphere favourable to epidemic diseases, on an army of foreigners, tumultuous and ill-accommodated, worn down with fatigue, or sinking in despondency.—With this reflection impressed on the mind, we may now proceed to a description of the city of Syracuse, and the country immediately adjacent, as they existed in ancient times, occasionally supplying illustrations from the accounts of modern travellers.

The once beautiful city of Syracuse consisted of five principal divisions; traces of all of which are still discernible. 1. The isle, Ortygia, Nasos or Nason: 2. Achradina: 3. Tyche or Tycha: 4. Neapolis, or the new city: and, 5. Epipolæ.‡

*Ortygia*, enclosed by the two ports—the great port on the west, and the little port on the east, and connected with the continent by a bridge—is of an oblong form, and about two miles in circumference.§ Here the original settlement commenced, and this was always considered as the wealthiest and most desirable part of Syracuse. It was the ancient residence of the kings; and, in the time of Cicero, still contained the house of Hiero. It was ornamented with various public buildings, particularly the temples of Diana and Minerva; and, in part, watered by the poetic foun-

\* Cicero in Ver. act. II. lib. v. § 80.

† De Non's Travels, p. 383.—Translation.

‡ Cicero in Ver. act. II. lib. iv. § 118. De Non, p. 304. et sequent. Swinburne, vol. ii. p. 309.

§ De Non, Swinburne.

tain of Arethusa. As the population increased, the sound which divided Ortygia from the continent was filled up, and the isle converted into a peninsula.\* Carlos III. of Spain, removed the earth by which they were united; and Ortygia is again an island, and connected with the continent, as formerly, by a bridge.†

The situation of Ortygia is important; for it commands both the ports; and though supposed itself to be commanded by Achradina, yet, while that quarter of the city remained in the possession of the Syracusans, together with the isle, and the opposite promontory of Plemmyrium, the town was nearly inaccessible to a naval force.‡ At present Ortygia is the only city. To this state it was reduced by the Musselmén. It is strongly defended towards the land, weakly towards the sea-side. Its quay is small; its streets narrow, winding, and wretchedly built; and its population does not exceed 18,000 persons.§ The fountain of Arethusa, after repeated changes of situation,|| is still discoverable in the west part of the isle; but its beauty and its honours have fled with the mythology to which it is indebted for its fame.

*Achradina.* The quarter of Achradina, at the period to which this essay has particular reference, was the most spacious, well built, and strongly fortified part of the city. It extends over two considerable levels, divided by a natural wall of calcareous rocks; the one as elevated as Tyche, the other, and more considerable, on a plane with Ortygia, and thence conferring on this quarter the character of the lowest division of Syracuse. The eastern part was the most commodious, and not less extensive than the modern Paris. The whole was adorned with a large forum, a beautiful portico, prytaneum, curia, and the temple of Jupiter Olympus; bordered on three sides by the sea, by the great port on the west, the lesser on the south, and the port of Trogilus on the east; and, on all sides, nearly impregnable. The rocks of this quarter of Syracuse, which are formed by marine depositions, possess the singular property of dissipating or absorbing the moisture of dead bodies so speedily, that they are preserved in vaults excavated for the purpose, in their proper form and habiliments. Achradina is remarkably fertile, and naturally adapted for bringing to perfection every tropical production.¶

*Tyche*, or the third city, extended northerly, from Achradina to Epipolæ; commencing at the bottom of the port of Trogilus,

\* De Non. Swinburne.

† Brydone's Tour, letter xiii.

‡ De Non. Swinburne.

§ Swinburne, vol. ii. p. 311—312. De Non, p. 304.

|| De Non, p. 307.

¶ Cicero ut antea. De Non, p. 321. et sequent. Swinburne, vol. ii. p. 313, 314, 315. Rollin's Rom. Hist. vol. v. p. 204.

which forms its south-eastern boundary. East, it was defended by a strong wall; and a wall divided it, on the west, from Neapolis. The famous gate of Hexapylon was on the eastern wall, and opposite to the little town of Leon. Tyche was ornamented by the Gymnasium; and, though now desolate, was once filled with inhabitants. It is very elevated; rising in rapid gradation from the wall of Achradina.\*

Neapolis ran nearly parallel, and in the same direction with Tyche; terminating on the north, with that quarter, at Epipolæ. On the east, south, and west, it was equally protected by a wall. The upper and northern part of Neapolis, as of Tyche, was elevated; its south-western extremity was considerably lower. A noble theatre, and the temples of Ceres and Bacchus, were its most distinguished ornaments.†

Epipolæ was originally a piece of high ground without the city, and afterwards so little inhabited that it is not mentioned by Cicero, in his description of Syracuse. The most elevated situation, and commanding Tyche and Neapolis, it was judiciously inclosed by Dionysius I. who surrounded it with a wall of near four miles in extent. Its additional defence was the fortress of Labdalon, at its bottom, on the east, and that of Euryalus, at its top, on the north.‡

The whole extent of the city of Syracuse, according to Strabo, whose account is verified by the concurrent testimony of Mr. Swinburne, was equal to twenty-two miles and four furlongs, English measure.§

To this brief description of the principal divisions of this famous city it is necessary to add a few remarks relative to its immediate vicinage, and the waters by which it is surrounded.

The great harbour or port is about five miles in circumference, and forms, at its north-western extremity, the Gulf of Dascon. Lower down, and opposite to Ortygia, it is contracted by the promontory and fort of Plemmyrium.—The little port, or portus marmoreus, divides Ortygia from the continent on the east, and washes the southern wall of Achradina. The Bay of Thapsus runs up behind Achradina on the east, and forms, by the junction of its western extremity with the city, the Port of Trogilus.||

At the distance of about two miles from Ortygia, and somewhat less than a mile and a half from Neapolis—whose western wall crossed the low grounds through which it runs—the river Anapus empties into the great harbour. This stream, which is

\* Cicero. Rollin. De Non. Swinburne.

† Cicero. Rollin. De Non. Swinburne.

‡ Rollin. Swinburne. De Non.

§ Swinburne, vol. ii. p. 309.

|| Rollin. Swinburne. De Non.



only twenty-four feet wide, and twelve or fifteen deep at its mouth, flows, in a serpentine course, through a small extent of country; which, though slightly elevated on its south or south-western side, on the north and north-west consists of an extensive marshy plain.\*

Between the Anapus and the promontory of Plemmyrium, was situated the little suburb of Olympia, surrounding the site of the ancient temple of Jupiter Olympus, built upon an eminence, and bounded on either side by the vast Lysimelian marshes, extending from the head of the great harbour, half covered with water in the vernal months, and exhaling under a vertical sun the most unwholesome and pernicious vapours.†

The preceding detail, it is hoped, will neither be found altogether tiresome, nor foreign to the purpose of this essay. Some part of it might, indeed, have been omitted, as not directly essential to the main design of the paper; but there would have been less unity in the description, and some portion of the subsequent narration might have been less perfectly comprehended.

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#### Section II.

THE pestilential diseases prevailing in the neighbourhood of Syracuse, to which the present inquiry is limited, occurred at three distinct periods: at the three sieges of that city, by the Athenians and their allies, under Nicias; by the Carthaginians, under Imilcon; and by the Romans, under Marcellus. It is exceedingly to be regretted, that, considering the singular mortality which distinguished each of these plagues, the information concerning them is so scanty and general. But the precision which remarkably characterizes that which remains, renders it of sufficient importance to deserve particular attention. It is the purpose of the present section to place before the reader, in a succinct narration, the circumstances which the historians have preserved relative to each of these interesting events.

In the second year of the famous contest between the Syracusans and the Athenians, of which Thucydides has left so minute and so touching an account, the Athenians, whose principal encampments were on the east of Syracuse—at Leon, at Thapsus,

\* Rollin. Swinburne. De Non. Thucydides, B. vi. and vii.

† Rollin. De Non. Swinburne. Watkin's Travels, letter xxiv.

The reader will find great assistance in comprehending distinctly every part of the preceding description, from consulting the plan of Syracuse in Rollin's Ancient History, or that in his Roman History, which, though inaccurate in some respects, I have reason to believe the most correct.

at Labdaliūm, and on the port of Trogilus—undertook the construction of a wall, which extended to Epipolæ, and was designed, after crossing the plain and the marshes of the Anapus, to reach to the great harbour on the west, and inclose the city. From the completion of this enterprize they were prevented by the exertions of the Syracusans, who carried a division wall, from the city, across the marsh, and thus opposed an insurmountable barrier to the progress of their besiegers. To promote his design, of the success of which he now began to entertain doubts, and to enable him more effectually to annoy the enemy by water, the Athenian general fortified and transported his army to Plemmyrium. From this time the fortune of the Athenians changed: their fatigue was great and incessant; every trifling success was succeeded by some sad reverse; relief was distant and uncertain; and they became a prey to despondency, not a little heightened by a sense of the injustice of their cause, their exemplary humiliation, and the unexpected superiority of their antagonists. Under these circumstances, in the autumnal season, and “encamped on marshy and unwholesome ground,”\* a situation “always unhealthy for an army, and especially in this season of the year,”† a pestilential disease shewed itself in the camp, extending with the progress of the season, and the continued exposure of the soldiery, or, as Plutarch expresses himself, by contagion; till, harrassed by the enemy on one part, and worn down by fatigue and sickness on the other, the Athenians were driven to the sad necessity of attempting a forced and secret retreat, with the dereliction of their camp, their wounded, and their sick. The consummate eloquence of Thucydides alone is adequate to the description of this scene of horrors.

Of the numbers who perished by this pestilence, and of its particular symptoms, no record is transmitted down to us. The event of this siege is known. The Athenians were surrounded on their retreat, and defeated, with immense destruction, and under the most melancholy circumstances of distress: their general, worthy of a better fate, was cruelly put to death; and the greater part of those who were made prisoners perished in Syracuse, the victims of diseases induced by excessive labour and unwholesome food. A few (in such honour was poesy among the ancients) were emancipated by the recollection and recitation of even a single verse of the pathetic tragedies of Euripides.‡

\* Smith's Thucydides, vol. ii. p. 236.

† Plutarch, art. Nicias.

‡ Ibid.—For the particular history of this siege of Syracuse, the reader is referred, generally, to Thucydides, B. vi. and vii. and to the life of Nicias, by Plutarch.



At a subsequent period, and during the war between the Carthaginians and Dionysius the elder, Himilco, or Imilcon, after several successful enterprizes in other parts of Sicily, marched against Syracuse. He invaded it with an army of 300,000 foot and 3000 horse; while the Carthaginian fleet, of 200 ships, under the command of Mago, followed by 500 barks, entered the great port in a triumphal manner, and laden with the spoils of the ravaged cities of the island. Imilcon "pitched his tent in the very temple of Jupiter, then standing at Olympia; and his army encamped around him. In this situation, "an eminence "between two morasses, highly favourable for a camp, and for "rendering it impregnable," he continued thirty days, laying waste the country on all sides, plundering the temples, and demolishing the tombs of the kings, and, in vain, offering battle to the Syracusans, who had not the courage to attack or oppose him. Nature, more powerful than themselves, arrested the progress of that fate which threatened to overwhelm them. "It was now in "the midst of summer, and the heat this year was excessive." While Imilcon continued at Olympia, spreading devastation around him, and anticipated a signal revenge upon the hostile Syracusans, a pestilential malady shewed itself in his camp. It appeared first among his auxiliaries, the Africans, who, forced into the service by fear of the Carthaginians, whom they hated, were probably least carefully accommodated. From them it soon extended, by the increasing virulence and activity of the exciting cause, throughout the army. Neither cares nor medicine afforded relief. At first the sick received some assistance from the well: but the pestilence and the mortality multiplied themselves so rapidly, in every direction, that this soon became impossible; nor were there men to be found for the performance of the rites of sepulture to the accumulating dead. "Violent dysenteries, raging "fevers, burning entrails, and acute pains in every part of the "body," were the usual symptoms of this terrible disease. Some were even seized with madness; and, in their frenzy, attacked, and endeavoured to destroy, all that were exposed to their assaults. Meantime the Syracusans, in health and safety, in their elevated, dry, and airy city, watched the progress of the pestilence among their enemies, and, profiting by their forlorn condition, captured or involved in flames their mighty fleet; and, storming their camp, impregnable to the greatest force, when defended by even a small body of healthy troops, defeated them with exemplary destruction. Thus beset, enfeebled by disease and humbled by defeat, the proud Imilcon, who, a short time before, held the conquest, not only of Syracuse, but of Sicily, too cheap and easy a victory for so formidable an host, was reduced to purchase his

safety for 300 talents, and fled, leaving, unburied, the carcasses of 150,000 of his soldiery.\*

The history of the last of those pestilential diseases, which are particularly selected for present consideration, deserves a longer and more attentive examination. Furnishing excellent illustration of several important points in the history of these disorders, the reader will doubtless excuse such preliminary narration as may conduce to place it more fully before him.

The Roman army, under the command of Marcellus, decamped from their station at Leontium, the modern Lentini—and, arriving at Syracuse, encamped at Olympia. After an unsuccessful attempt at negociation, the city was besieged in due form; and the attack commenced on Hexapylon, by land, and on Achradina, by water. But the Roman general was not successful at Syracuse, as he had been at Leontium. All his exertions were rendered nugatory by the talents of a single citizen, and the genius of Archimedes triumphed over the power of Rome.

Necessitated to defer the further operations of the siege, the consul directed his arms against several other Sicilian cities, and struck his enemies with terror, by his brilliant achievements.—About the same time, the Carthaginian general, Himilco, arrived at Agrigentum, to the aid of the Sicilians; with an army of 25,000 foot, 3000 horse, and twelve elephants. Hippocrates, one of the Syracusan leaders, with a part of the Syracusan troops, marched out to meet him; Epicedes having been left, with the remainder, for the defence of the city. After some skirmishes

\* Rollin's Ancient History, vol. i. p. 302, 303, 304. De Non's Travels, p. 358, 359. &c. Diodorus Siculus, lib. xiv. p. 279—295.

The Carthaginians seem to have been destined to owe the defeat of many of their most promising enterprizes in Sicily to pestilential diseases.—In a former part of the same war, whose unhappy termination has been described above, Hannibal, the predecessor of Imilcon, laid siege to the city of Agrigentum (Girgenti), in the south-western part of Sicily. For the purpose of raising a wall without, which should overlook and command the city walls, he collected all the materials within his reach; and, among the rest, destroyed, and converted to this use, the tombs standing round a city very ancient and populous, and then containing 200,000 inhabitants. From the uncovering and disturbing of so many dead bodies arose a terrible pestilence, which carried off immense numbers of the Carthaginians, and the general himself. Afflicted at this dreadful mortality, the besiegers attributed it, with the superstition of the age, to the vengeance of the Gods, incensed against them for violating the repose of the dead. The healthiness of the situation, the season, and the thorough appointment and supplies of the Carthaginian army, leave no room to doubt as to the real cause of the sickness, which gradually disappeared; but two remarks of some importance are suggested by it. 1. The folly of modern nations, especially in warm climates, in suffering the interment of the dead within their cities. 2. The wisdom of some ancient nations, in having a dead as well as a living town.

with the Sicilian army, in which he was fortunate, Marcellus returned to Syracuse, whither he was soon followed by Himilco and Hippocrates, who, having formed a junction, fixed their camp at the river Anapus, about eight miles from the city. Nothing of importance occurred while the armies lay near each other. The combined chiefs soon drew off their forces; the Carthaginian general took up his winter residence at Agrigentum, and the Sicilian at Murgantia. Marcellus, who had been, for some time, busied in the interior, now again returning, appointed Crispinus to the command of the ancient camp at Olympia, and built and fortified a camp at Leon, on the eastern side of Syracuse, for himself.

The Romans commenced their operations early in the spring. Some of them having gained an entrance into Syracuse, in the night, by stratagem, the gate at Hexapylon was broken open, and Marcellus entering, secured possession of Epipolæ, before any effectual resistance could be attempted by Epicedes. Tyche and Neapolis surrendered at discretion; the fortress of Euryalus speedily submitted; and the consul disposed this part of his army, against Achradina, in three places, hoping to carry it by attack, or subdue it by famine.

While these preparations were going forward, on the part of the Romans, Himilco and Hippocrates suddenly returned to Syracuse, and encamped on the great harbour. From hence they attacked Crispinus, in the ancient camp of the Romans, while Epicedes, in concert, sallied out from the city upon the posts of Marcellus. Neither of these assaults succeeded. Crispinus repulsed the allies, and pursued them triumphantly to their station, at the same time that Marcellus compelled Epicedes to take refuge within the walls of Achradina. After this, both of the Roman commanders strengthened their encampments.

Such was the progress and state of the war, when a pestilence, common to both armies, appeared both in the camp of the allies and of Crispinus, and naturally diverted their attention from hostile operations: for the autumnal season, their unhealthy situation, and the heat (much more intolerable without than in the city), affected almost every person in either camp. At first they became sick, and died, simply from the effects of the season and the unhealthiness of their situation: afterwards, says the historian, the care and contact of the sick spread the disease; so that those who were attacked with it perished, neglected and forsaken; or their attendants fell victims to their humanity. Deaths and funerals passed before the view in rapid succession, and day and night resounded with lamentations. At length these scenes of calamity became so familiar, that they not only neither wept, nor lamented the dead, but even ceased to remove, or yet to inter them. Their

lifeless bodies lay extended in heaps, in the very sight of those who expected a similar fate; while the dead infected the sick, and the sick those who were in health, as well with fear as with the corruption and pestiferous exhalations from the bodies: so that, impatient of life, and desirous rather to fall by the sword, some singly invaded the stations of the enemy. The plague raged with far greater violence in the Carthaginian than in the Roman camp: for the Romans, from long residence in the vicinity of Syracuse, had become accustomed to the air and water. As soon as the Sicilian auxiliaries of the Carthaginians perceived that the disease spread from the insalubrity of the place, they betook themselves to their nearest cities; but the Carthaginians, admitted into no city, together with their generals, Himilco and Hippocrates, totally perished. Marcellus, observing how fast the disorder increased, drew the remainder of his troops into the city, where, under shelter, and in the shade of the houses, they regained health and vigour: notwithstanding, many of the Roman army were carried off by the same pestilence.\*

Thus the Lysimelian marshes triumphed over a third army; and a number not less than 30,000 were added to those who had fallen of the soldiery of Nicias and of Imilcon. The practical consideration of these events belongs to the succeeding section.

### Section III.

THE simplicity and uniformity of the preceding statements and narrative, preclude the necessity for laborious investigation and argument. The deductions to be made are unavoidably simple and uniform; but their force and tendency may be more distinctly perceived from a methodical arrangement.

I. Climate and season.—The climate of Sicily in general, and particularly of the city of Syracuse, is remarkably pleasant during a considerable part of the year. But the summers are excessively sultry; and this heat, operating on marshy situations and stagnant waters, never fails to engender malignant fevers. To these they are peculiarly liable in the summer and autumnal months. The pestilential diseases which proved so fatal to the armies of Nicias and Imilcon, and to those of the Carthaginians and the Romans, occurred either in the autumn or in the height of summer; and, in every instance, in the immediate vicinity of Syracuse.

II. Situation.—The camp of Nicias was near or at Plemmy-

\* Tit. Liv. typis Barbore, 1775. tom. III. lib. xxiv. & xxv. p. 303—403.



rium, of Imilcon at Olympia, of Crispinus at Olympia also, and of Himilco and Hippocrates at the head of the great harbour. The whole of this territory is a vast marsh, but partially covered with water even in spring, extremely offensive in summer, and noted, from time immemorial, for its insalubrity.

III. Condition of the armies.—The Athenian army was in constant action, and constantly unsuccessful. The army of Imilcon was in perpetual movement, but fortunate, and full of courage. The adverse armies, at the third siege, were in a state of inaction. These are certainly considerable differences: why should they not modify the event? It may be doubted whether any moral cause would be sufficient to protect, for a long period, an unaccustomed resident in a marshy situation, from the usual consequences. Fatigue and despondency are certainly favourable to the access of disease; and inaction, particularly in camps, is generally admitted to be scarcely less so. The uncommon heat of the year of Imilcon's irruption into Sicily, may be a satisfactory explanation why his successful troops were so readily affected by the unwholesomeness of his camp.

IV. Progress of the disease.—The sick, in the army of Nicias, were not numerous at first; but the number gradually increased. This is attributed, by Plutarch, to contagion; but Thucydides, a cotemporary and more sagacious historian, expresses no such opinion, nor does it seem probable. The growing desperation of the Athenian affairs, and the tendency of the season to augment the extent and heighten the virulence of marsh exhalations, sufficiently account for the increasing predisposition to sickness, and for its more general prevalence in their army.

The same reasoning will apply, generally, to the case of Imilcon's army; but there were, in this instance, additional causes for the production of such immense mortality. The commencement of this pestilence was among his African auxiliaries. The circumstances of their impressment into the service, and of the contempt in which they were held by the Carthaginians, render it probable that less care was taken to accommodate them than the others. Some peculiar habits of body, modes of life, or varieties of native climate, might influence this event; or they might have been previously subjected to greater fatigue. Be this as it may, the sickness soon became universal, and so mortal that the dead lay unburied.—In a situation like this, there is no reason to believe that much attention was, at any time, paid to the necessary duties of cleanliness. When the sick could find no attendants, and the dead none to inter them, it requires but little sagacity to infer that no means were used for the removal of excrementitious matters. And, as a large proportion of this army were afflicted with dysentery, and the number of putrefying carcases

must have been immense, and as the limits of the camp were not very extensive, and they were now sorely pressed by a vigorous enemy, incapable themselves of resistance, and suddenly precipitated from triumph to inevitable defeat and shame, we shall find no difficulty in assigning causes sufficient and satisfactory for the extraordinary fatality of this pestilence.

The third plague commenced at the same time, in both the Carthaginian and Roman camps. At first, as in the former instance, the sick were attended to; but the number soon became so great as to render this impossible. In this case, as in the other, the dead were left unburied and to putrefy; and in this case, as in that, there is no reason to doubt but that the causes and fatality of the diseases were, in consequence, exceedingly augmented. It may reasonably be doubted, however, whether the historian is accurate in ascribing any part of the spread of the pestilence to contact of the sick. The belief of this doctrine has been of long duration and extensive prevalence; but late observations do not seem to countenance its validity. To establish it would inevitably annihilate a distinction much insisted on by the advocates for the importation of pestilential diseases into the United States; but this argument is not wanted for that purpose. It is more probable that the pestilence, in this instance, as in that preceding, was rendered more general by the increasing quantity and concentration of marsh effluvia; by the excrementitious matters in the camps, suffered to assume, unremoved, a putrescent action; and by noxious exhalations from putrefying bodies. There are no facts which authorize the opinion that a specific matter emanates from any part of the body, during pestilential or any other fevers properly so called, capable of generating a similar or a febrile disease. The most that we may venture to infer from all the facts known to us is, that the perspirable matter, like any other animal substance, when separated from the living body, or deprived of life, is liable, under certain circumstances of temperature and moisture, to undergo a putrefactive fermentation, or to go through such changes as shall adapt it for the production of febrile diseases; and this, as well when suffered to lie on the skin, as when elsewhere or otherwise disposed of. With these limitations, and in this view of the question, there need be no objection to the testimony of Livy; nor have we any ground, from a knowledge of the symptoms of the plague he describes, to oppose or fortify his narration.

V. Mortality of the pestilence.—Of the mortality of the sickness which affected the army under Nicias, we only know that it was considerable. Our knowledge is not much more definite respecting the number of the Carthaginians who perished of the army of Imilcon. There is reason, however, to believe that it far exceeded that of the Athenians; and, probably, it was not less

than 100,000 men. For it must be recollected, that many had been regularly interred in the first of the plague, and that all the sick and wounded were left behind, when their general ingloriously fled from Sicily. Nor is it probable that a number greatly exceeding 50,000 fell in the battle which preceded his flight. In the last case, our computation may be nearer the truth.—The army with which Himilco invaded Syracuse amounted to 28,000, exclusive of his Sicilian auxiliaries, and of the troops from that city, which joined him under the command of Hippocrates. The defeat of this last, by Marcellus, the preceding year; the secession of the Sicilians; and his own losses, in the various actions in which he had been previously engaged, had, no doubt, reduced his army below its original strength. But, when it is remembered that all this army perished, and that a less, but still a great, number of the Roman army also were destroyed by the plague, there is reason to estimate the whole loss as exceeding 30,000. The entire number of men sacrificed to this unhealthy situation, in three successive periods, could not be less than 150,000—a most melancholy illustration of the influence of climate, season, and soil, on the health of mankind; and an example of the activity of local causes in producing disease, compared with which, all the yellow fevers of the United States, whether originating here or imported from abroad, scarcely deserve to be remembered.

VI. Symptoms and nature of the pestilence.—On this point our information is less complete than on any other. The sickness in the Athenian army is simply called a fever, said to be contagious by Plutarch, but probably not so. Livy describes no symptoms of the plague recorded by him. Diodorus Siculus is somewhat more particular; but only so far as to mark the variety of form in which the soldiers of Imilcon were attacked by the disease. In some, in the shape of enteritis, or inflammation of the bowels; in others, of dysentery; sometimes invading as a violent fever, with acute pains in every part of the body; and sometimes with madness or delirium. Yet, even these scanty particulars are of importance, as they serve to identify the disease, and to proclaim its strict affinity to those which are the common offspring of such situations as that in which the army were encamped, and those which have spread so much apprehension, and excited so much discussion in our own country.

VII. Cessation of the pestilence.—Another circumstance which characterizes the disease under consideration, is the manner in which it was extinguished. So long as Nicias remained in his camp, he saw his men constantly dying around him, by sickness. His removal, notwithstanding the subsequent calamities which befel him, appears to have thoroughly delivered his army from fevers.



The survivors were employed as slaves in Syracuse; which could scarcely have happened had they been sick, or had the Syracusans dreaded the introduction of a contagious disease by their means. —Imilcon preserved the residue of his army only by flight. There was no other hope for their safety; and, after his return to Carthage, he exclaimed, in the bitterness of his grief, that the plague, not the enemy, had conquered him. But neither then nor before did the dry and airy city of Syracuse suffer from any sickness; nor did the fear of contagion prevent the Syracusans from repeatedly attacking the Athenian and Carthaginian camps. Their minds were probably unwarped by the bias of system, and they discerned, in the position of their enemies, the true cause of their misfortunes.—The facts related by Livy are singularly precise and important. In the first place, neither the citizens of Syracuse, nor the army of Epicedes, which had possession of Ortygia and Achradina, nor that part of the Roman army which, under the command of Marcellus, was stationed in the elevated quarters of Tyche, Neapolis and Epipolæ, were in the least affected by the plague. But this calamity was limited to the Romans, under Crispinus, in the ancient camp at Olympia; and to the allies, who were encamped at the head of the great port. Crispinus and his troops, who had lived at Olympia a considerable part of the two preceding years, or at least had remained in the vicinity of Syracuse, and had become, in a degree, habituated to the air and water, suffered less severely than their enemies; and, when the sickness became general among them, recruited, and ceased to be taken sick, in consequence of a removal to the high grounds of the city, occupied by their countrymen. The natives of the island, seeing the danger to which they were exposed, took refuge in their own cities, and escaped the disease. But the Carthaginians, without any place of refuge, and entirely unaccustomed to their situation, totally perished.

VIII. On the whole, then, it appears, that the mortality, in every instance, occurring in the armies near Syracuse, originated entirely from local causes; that there is no reason to suspect that this mortality was heightened by contagion, in the usual acceptance of that term; that the symptoms, so far as we have any account of them, were similar to those which occur, under similar circumstances, in the East and West Indies, in our own country, and in every part of the world; and that, as no difference is recorded as existing between these great epidemics or endemics, before and after the causes were increased by animal putrefaction, the advocates for the foreign derivation of pestilential diseases must relinquish the distinction between fevers from animal and vegetable putrefaction; or, if they maintain the contagious quality of the former, must admit, on equal evidence, the same quality as

characterizing the latter. To this it may be added, that as it was the universal practice of the ancients to designate any and every wide-wasting disease by the name of plague, without any special reference to its peculiar symptoms, so there is an equal propriety in our conferring the same appellation on our dysenteries and fevers; nor do these less deserve the title than the fevers of Smyrna, Cairo, and Constantinople, which resemble them in their origin, their varieties of prevalence and degree, their appearance and disappearance, and which would, in all probability, yield to the same regimen and remedies.



## ARTICLE II.

*On the PHLOGISTIC THEORY; communicated in a seventh Letter  
from Dr. PRIESTLEY to Dr. MITCHILL.*

*Northumberland, January 17, 1799.*

DEAR SIR,

I PROMISED you one letter more on the subject of the *phlogistic theory*, and I now send it. You will find it to consist of miscellaneous articles, some of more, and others of less importance to the decision of the question that is now before the public. All the letters that I have sent you relate principally to original and recent experiments, to which I have given a good part of the leisure of the last summer; and I do not propose to do any thing more on the subject till I hear from the great authors and advocates of the theory that I combat in France; and, as we have not now any intercourse with that country, it will, probably, be a considerable time before that can be done.

I am glad, however, to find several able advocates of the system in this country; and some of them, I am confident, will do themselves honour by their candour, as well as their ability. I am pretty certain, that if due attention be given to the subject, the controversy will be decided, to general satisfaction, in a very few years. And, whenever I see reason to think that my opponents have advanced all that they can in answer to what I have done and written, I shall give an account of the impression that their observations shall have made on my mind, freely acknowledging any mistakes into which I may have fallen. But with my best endeavours to be impartial, and attentive to every fact that I have stated, I may have overlooked some important circumstances relating to them, and have reasoned inconclusively from them.

1. Inflammable air is sometimes procured when one metal is precipitated by another in its metallic state. This is a fact that is very easily explained, on the supposition that the metal precipitated does not require so much phlogiston as that which was dissolved; whereas, the doctrine of the decomposition of water cannot, as far as I see, account for the fact, at least in an easy and natural way.

When zinc is used to precipitate lead from a solution of sugar of lead, inflammable air is procured; and, according to the phlogistic theory, it ought to be so, since lead contains much less phlogiston than zinc; so that, when the former is revived by means

of the latter, it is able to furnish more than is requisite for the purpose. But if this inflammable air come from the decomposition of the water, the oxygene, which must be developed at the same time, ought to be found either in the water, or in what remains of the zinc; for it will not be pretended to be in the lead that is revived; and there are no other substances present: and yet, when I examine this water, I find it entirely free from acidity, and that it yields air much less pure than that of the atmosphere.

Iron, I also find, will yield more inflammable air by solution in acids than zinc; and a saturated solution of iron in the marine acid yields inflammable air by the solution of zinc.

2. In some of the preceding letters I gave an account of the production of inflammable air from zinc, by means of steam, similar to that by which the same kind of air is procured from iron. In this case the iron receives a great addition to its weight, which the antiphlogistians say arises from the oxygene corresponding to the hydrogen of the inflammable air; both coming from the decomposition of the water. But as the zinc gains no weight in this process, the result of the experiment appears to me to be favourable to the phlogistic theory, according to which the inflammable air comes from the metal.

This being an experiment of some consequence, I have lately repeated it, and it may be worth while to recite some of the particulars of it. Having put an ounce of zinc into an earthen tube, to which I gave a red heat, I made steam pass over it till I had procured about 300 ounce measures of inflammable air; after which I found the greatest part of the zinc reduced to a dark coloured semi-transparent glass, adhering pretty closely to the tube. I was able, however, to separate them; and I am confident that the calx did not weigh more than the metal had done; whereas, computing from the proportion of 85 parts of oxygene to 15 of hydrogen (into which it is said that water is resolvable), it will be found that it ought to have gained about 100 grains. Since, then, this great proportion of oxygene is not found, either in the calx or in the water (for this also I examined), where will the antiphlogistians say that we are to look for it? For, since the water, they say, is decomposed to furnish the inflammable air, it must be somewhere.

3. I have also repeated the experiment of the revival of red precipitate, in inflammable air, over mercury; observing, particularly, that there was neither *fixed air*, nor any sensible quantity of *water* produced, though much inflammable air disappeared. This air, therefore, must have entered into the mercury that was revived, and did not unite with any thing that was expelled from the precipitate.

4. It is said by the antiphlogistians, that spirit of nitre never becomes coloured by imbibing any thing, but always in consequence of giving out oxygene. I think, however, that the contrary is proved by its decomposing nitrous air. But the same effect is produced, though not in so remarkable a manner, by means of inflammable air. I put a quantity of dephlogisticated spirit of nitre into a phial with a ground glass stopper, with inflammable air on its surface; and, in another similar phial, atmospherical air was confined with it. Both of these phials I covered with water in inverted glass jars, to prevent their having any communication with the atmosphere. After long exposure in these circumstances, that which had the common air on its surface never acquired any colour, or only a very little, from the effect of light, transmitted through two glasses, with water between them; but that on the surface of which the inflammable air was incumbent, acquired colour very soon. I also found, on repeating the experiment, that a part of the inflammable air had been imbibed by the acid. To make this experiment, a phial, filled with the acid, must be introduced into a jar of inflammable air, and part of it being poured out, the stopper must be put into it in that situation. Other precautions must be used, which a little experience will teach.

5. I cannot help thinking that many of my experiments prove the generation of both *fixed air* and *phlogisticated air* from the same elements, viz. dephlogisticated and inflammable air, or phlogiston; whereas, the antiphlogistians say that fixed air can only be produced by the union of carbone, or charcoal, with pure air; and that phlogisticated air is a simple substance, called by them *azote*. I shall, however, mention a few more observations, which, I think, support what I have advanced on this subject.

Having made much use of a mixture of iron filings and sulphur for the purpose of phlogisticating air, I have always had a large quantity, which had been long exposed to the atmosphere, from which it is allowed that it attracts nothing besides dephlogisticated air. Of this mixture, then, quite dry and brown,  $3\frac{1}{2}$  ounces, exposed to heat in an earthen tube, gave 120 ounce measures of air, of which about one-tenth was fixed air, and the rest almost wholly phlogisticated. Both these kinds of air, therefore, must consist of dephlogisticated air from the atmosphere, and something contained in the iron or sulphur, both of which are maintained to be simple substances. There remained a black powder, strongly attracted by the magnet.

6. In general, iron filings and sulphur, immersed in mercury or water, or placed in a vacuum, yield inflammable air: but, in some cases (though I do not know the reason of the difference), this mixture has yielded phlogisticated air. Having placed a



pot, containing this mixture, in a vacuum, I found, after some days, that it had yielded  $2\frac{1}{2}$  ounce measures of air; and, examining it, I found it to be completely phlogisticated. I then put the same mixture under water, and, placing it near the fire, it gave an ounce measure more, all phlogisticated.

At another time, two ounce measures of air were yielded by a mixture of this kind; and, being examined long after it was formed, it was found to be wholly phlogisticated. It might, however, have been inflammable air, which had undergone that change.

7. From a quantity of calx of lead, part grey and part yellow, in a glass tube, I got about its bulk of almost pure fixed air; and the residuum extinguished a candle. Where could be the carbone in this case?

8. A solution of copper in volatile alkali gave phlogisticated air, with the marine acid; and it will not be easy to say where this azote existed before the process.

9. It is generally thought, that the fixed air contained in *fallen lime* has been attracted from the atmosphere, in which it is said to float in a loose, uncombined state. But, from no other experiment that I am acquainted with can it be proved, that any fixed air necessarily exists in the atmosphere; and lime, and lime-water, will acquire it in all situations. I am, therefore, inclined to think, that this fixed air is composed of phlogiston, imparted to the lime from the fire to which it had been exposed, and the dephlogisticated air in the atmosphere; and I have always found that a portion of atmospherical air, exposed some time to lime, or to lime-water, is sensibly less pure than before; some part of the dephlogisticated air, of which it is composed, having been taken from it by the lime; and it is never found again, except as a component part of the fixed air, which is afterwards expelled from it.

The fixed air which is expelled from the yellow calx of lead, which has been some time exposed to the atmosphere, has, I doubt not, the same source: for, when it is heated presently after it is made, little or no air can be expelled from it, as it may some time afterwards. And I find that this substance also, exposed to a portion of atmospherical air, makes it less pure than it was before, just as in the case of quick-lime.

10. That phlogisticated air is sometimes produced from the union of dephlogisticated air in the atmosphere, and phlogiston in the substances exposed to it, I think I have sufficiently proved. I shall, however, just mention another experiment, which is easily repeated, and which, I think, demonstrates the same thing. It is well known that hot charcoal imbibes any kind of air; and I have observed that, when it is afterwards put into water, it gives this air out again. But if the air be that of the atmosphere, it

takes the dephlogisticated part in preference to the other, leaving the remainder phlogisticated: and the air that it gives out after this, in water, is chiefly phlogisticated also. What, then, becomes of the dephlogisticated air that has disappeared? Will it be said that it remains in the charcoal which had imbibed it? Whence, then, came the phlogisticated air which it gave out, when, according to the new theory, charcoal does not contain any such principle? It is not found in the water into which it is put: for this gives out air less pure than it did before the process.

Before the new theory of chemistry can be unexceptionably established, the following things must be done: 1. Whenever inflammable air, or *hydrogene*, is procured, evidence must be given of the production of a due proportion of *oxygene*; i. e. 85 of this to 15 of the other: and this evidence must be something more than an addition of weight to any thing. It must be either actual *acidity*, or *dephlogisticated air*—otherwise there is no proof of the inflammable air coming from the decomposition of water. This, however, has not yet been done, with respect to iron, or any other substance by means of which inflammable air is procured.

2. When water is procured by the burning of inflammable air in dephlogisticated air, the water must not only be free from acidity, but there must be no production of *phlogisticated air* in the process: for, by the decomposition of this air, nitrous acid may be procured.

I am,

Dear Sir,

Yours sincerely,

J. PRIESTLEY.

P. S. As your publication is the only one in this country that is periodical, and comes out at reasonably short intervals, which is a circumstance of great importance to the communication of philosophical intelligence, I shall occasionally trouble you with an account of what may occur in my experimental inquiries. Medicine and general philosophy have a very near connection; and a periodical publication, purely philosophical, can hardly be expected at short intervals, in a new country like this. It will, therefore, be glad to avail itself of the support of medicine, till it be in a condition to support itself.



## ARTICLE III.

*On the same Subject; communicated in an eighth Letter from Dr. PRIESTLEY to Dr. MITCHILL.*

DEAR SIR,

Northumberland, February 1, 1799.

I INTENDED my last letter to have concluded my defence of the phlogistic system; but having lately, with another view, repeated some of my former experiments on the effect of a *continued heat*; and, among others, that of the production of sulphur from water impregnated with vitriolic acid air, it occurred to me that it would furnish an argument in favour of my hypothesis, and that it might exercise the ingenuity of my opponents to shew its consistency with theirs.

Sulphur, the antiphlogistians say, is a simple substance, and that the acid of vitriol is that substance, with the addition of pure air. Why, then, I ask, is not sulphur produced, when pure air is expelled from it by heat, rather than in the process above-mentioned? For, when this air is procured by making the acid pass through a red-hot earthen tube, no sulphur is found.

According to the phlogistic theory, the formation of sulphur from water impregnated with vitriolic acid air, is very easy, both the ingredients of which it is composed being present; viz. the basis of the vitriolic acid and phlogiston. They are only made to form a different combination by the heat, in a tube hermetically sealed: for the vitriolic acid air is produced by heating in vitriolic acid most of the metals, and any other substance, solid or liquid, that is said to contain phlogiston.

If it be said that the sulphur may be formed in my experiment, by the heat expelling the water attached to the acid, and the acid along with it, from its base, I answer, that then the water remaining in the tube should be more acid than before; whereas, I find it to be less so. This I account for from the extreme volatility of this acid. But, had the acid been that of vitriol unphlogisticated, it would have been obstinately retained by the water. Besides, it would surely be more easy to expel all acid from a liquor passing through a red-hot open tube, than from a liquor confined in a glass tube hermetically sealed, so that it cannot possibly escape, and where it is exposed to no more than a moderate degree of heat. For, had it approached to a red heat, the tube would have burst.

As, in my former experiments, I made phosphorus, as well as most of the metals, by means of the same inflammable air, whether procured from metals or any other substance, it is a proof that these substances, as well as sulphur, are compounds, and that phlogiston is the same thing in them all, and transferable from any one of them to any other, and that the metals, when deprived of it, are calces.

Having now recited a number of experiments, which appear to me to be incapable of a just explanation on the antiphlogistic theory, I wait for the remarks of my ingenious opponents, and may not, perhaps, make any reply till I can have before me all that they shall advance. When this is done, I shall either give my reasons for thinking their answers unsatisfactory, or acknowledge that they are well founded. I do not know that I have omitted to explain, as well as I could, every fact that has been urged in support of the new theory; but if my opponents will direct my attention to any others, I shall not fail to answer any questions they shall put to me with respect to them, as fully and as explicitly as I can, having, as far as I know myself, no object but the discovery of the truth.

If the experiments we appeal to be repeated with care, we shall, I doubt not, soon come to an agreement with respect to *them*; and then all that will remain will be to consider on what principles they are most naturally explained.

I am,

Dear Sir,

Yours sincerely,

J. PRIESTLEY.

*P. S.* As there are some things not so proper for the public eye, in my letter to you, p. 521 of the former volume, I must observe, that it was only a private letter, not intended for publication.



## ARTICLE IV.

*An Account of the PESTILENTIAL DISEASE which prevailed at Boston (Massachusetts) in the Summer and Autumn of 1798.*

By SAMUEL BROWN, M. D.

THE first appearance of the disease was in the family of Mr. Stoddard, in Fore-street, near the market-place—June 21st. Mrs. Stoddard died on the third day after the attack. Her daughter was next sick of the disease, and died within a short time—on the second or third day. Another young woman, and a son, were, with much difficulty, recovered of the disease.

The market-place is a low, sunken part of the town. It is, from situation, the reservoir of every putrid matter, flowing in from more elevated parts of the town, and accumulated by every rain. It is surrounded with docks of stagnant waters, filled with offal and all manner of noxious matters, which, becoming putrid, throw up, at every ebb of tide, a stench very disagreeable to the adjacent inhabitants. Besides, the market-house and stalls are always supplied, in abundance, with meats of various kinds, more or less of which will always, in the hotter season of the year, be in a state of incipient putrefaction; and sometimes far advanced. This assists to destroy the salubrity of the surrounding atmosphere, by loading it with animal effluvia, perceivable by the smell, many times, at the distance of an hundred yards or more.

July 21st. Again the disease appeared, on Codman's wharf, an appendage of the market-place, and near Stoddard's wharf, where it first appeared. Seven adults successively, but in a short time of each other, took the disease—all died. For two or three weeks, all the cases of the fever were of persons either stationed in or near the market, or who often frequented this place; and I am informed, that not one of twenty, or upwards, who first took the disease, was recovered.

Fort-hill was the other part of the town where the disease was most prevalent—on the front and south-easterly part of it—extending along to Liberty-square, and on through Kelby-street to State-street. In these two parts of the town, the matter of the disease seemed to be concentrated, and thence was taken and dispersed through the town, particularly through Fore-street and State-street.

Fort-hill is very much exposed to reflected heat. The western breezes are almost entirely excluded from the south-easterly sides

of the hill; while these are so inclined as to meet the sun's rays in perpendicular direction. These parts of the hill are by far the most thickly inhabited, and were the most sickly.

It should here be observed, that, in several of the buildings near the market (I think on Codman's wharf, and other adjacent wharves), were stored green hides, and some in a high state of putrefaction; so much so, that it was with much difficulty any person could be procured to transport them. They, finally, were offered for almost nothing to any one that should undertake their removal. A person appeared, took and deposited them in a cellar on Wheeler's point, where they were soon discovered by their intolerable smell, and ordered to be removed. Accordingly, they were next carried to an opposite shore, and spread upon a point of land to dry. The person thus employed immediately sickened, and died on the third day. These are circumstances not generally known during the fever. I had them from Dr. Warren. They are since confirmed by others.

On Fort-hill likewise, hides, to the amount of between 20 and 30,000, were deposited, and, when discovered, were in a similar state as the above. Also, large quantities of spoiled and putrid beef were found in stores and cellars, in and near these places. It will be remembered that all intercourse or commerce with the French West-Indies were expressly forbidden by a law of the general government enacted for this purpose: and this might be one cause why such quantities was suffered to spoil and waste.

Some fresh fish, in one of the stalls in Kelby-street, leading from State-street to Fort-hill, were thrown into a barrel or hogshead-tub, to be prepared for pickling. In this state they were neglected for several days, the owner being away fishing. They became very putrid, and, when the owner returned, were thrown into the dock: immediately such an intolerable effluvia arose, as to drive the people in the neighbourhood from their houses and their work. The neighbourhood soon became very sickly, and many died. Several of the families I attended with Dr. Jeffries.

Some putrid beef was thrown into one of the docks by Fore-street: the smell, for a time, was intolerably offensive. Several families were suddenly and severely seized by the disease, the most of whom died.

A man was found dead in a by-place near the market, concealed by some boards and other lumber. It was judged, from the great putrefaction in which he was found, that he had lain there a week or nine days. He was so completely rotten that the muscles and limbs could be easily plucked from the body. He was discovered by the horrid effluvia which exhaled. He was supposed to have died of the fever, as he was recollected to have been seen with all the leading symptoms of the disease upon him.

It may be well further to observe, of those parts of the town where the disease seemed to originate, that they are, in situation, low, confined, crowded with buildings, and full of inhabitants; shut out from northern and western breezes, open to the south and east; exposed to the sun's heat, and this greatly increased by reflection and refraction from pavement, buildings, &c. and on Fort-hill many of the buildings are white, which makes the reflection still greater. The streets are narrow, for the most part dirty, and not unfrequently filthy.

The number dead of the disease has been stated at 250: I believe that 300 is not above the real amount. Perhaps one out of three died: but the mortality varied according to circumstances.

The fever prevailed with much malignity till about the middle of October, when it was completely checked by an inundating storm from the north-east, of three days continuance. The atmosphere was much agitated by a strong wind, and so perfectly changed and salubriated, that, after this, scarcely a case of the fever occurred. The common bilious autumnal fever succeeded, and was considerably mortal. The last weeks in November, and in this present month (December), glandular tumefactions and inflammations, sore throat, and peripneumonic affections, have been pretty numerous, and the most frequent complaints: also, at present, there is a considerable number of cases of slow putrid or typhus fever.

In obstetric cases, during the fever, there seemed to be an unusual tendency to hæmorrhage, or flooding, proving fatal to a considerable number.

With regard to the general state of the atmosphere I shall only observe, that, during the latter part of July, the whole of August, and a part of September, the weather, perhaps, was never known so uniformly and excessively hot and debilitating. The winds generally from the south, and surcharged with heat, and often with a clammy moisture. The effect upon the constitution was not unlike what is told of the sirocco wind of Sicily. "During the continuance of this wind all nature appears to languish; vegetation withers, the beasts of the field droop, the animal spirits seem to be too much exhausted to admit of the least bodily exertion, and the spring and elasticity of the air appear to be lost; the pores of the body seem at once opened, and all the fibres relaxed; the appetite destroyed, and digestion slow, difficult, and much impaired."

The common atmosphere, for the most part, was opaque and smoky, as if the earth's surface were undergoing a slow combustion. It seemed a heterogeneous mixture of particles, in a state of opposition and propulsion: respiration frequent and unrefreshing. The sun, in mid-day height, appeared as a volume



of blood, dark and angry. As it declined to the western horizon, its diameter widened greatly; and, at an hour's height, or more, was almost invisible, or shrouded as with sackcloth. These appearances, however, were not constant.

Now, what is the probable cause of this disease, or what shall we denominate the poisonous matter so calamitous in its effects on the human constitution, and which has spread desolation and death through many of the most flourishing and populous cities and towns in the union?

Dr. Mitchell, of New-York, has made several very valuable and highly ingenious communications on this subject. He asserts, that septon, or azote, simply, or in combination, and under various modifications, is this poison so deleterious in its effects. I have seen but a part of his publications, and, therefore, am not in possession of all the facts and probabilities upon which he grounds his theory; but still enough to convince me that his opinion is the most probable and the best supported of any yet started. In a private letter, he says, "The distemper arises here (New-York), as in all parts of the country, and of the world, from excessive use of the *lean* parts of animals for food, from too free drinking of spirituous liquors, from too much *septon* accumulated in the muscles and nerves, as well as from a vitiated atmosphere."

The use of the *lean* parts of animals for food is hurtful, because of the abundance of septon which they afford, and from their greater tendency to putrefy. Animal substances, says Fourcroy, differ from vegetable substances in *putrefying* more easily and more speedily, and giving out a far more noisome smell, and in yielding, when acted upon by nitric acid, much more azotic gas.—Perhaps no people in the world make so free a use of flesh food as the Americans, especially in populous towns; and this generally fresh, and sometimes considerably advanced in putrefaction. Now, let the articles designed for aliment be vitiated, and also the respiration, and disease, sooner or later, is inevitable: for, the principal reason an animal body does not putrefy when alive, is its ventilation by respiration, thereby subducting such matters as are unfriendly to the health and life of the body, and supplying such as are congenial: another reason is, the continual accession of new particles, less disposed to putrefy than the living body, supplied by the food and drink.

There are many instances upon record, of the most suddenly fatal effects from the effluvia of animal putrefaction. Thus, from the Encyclopædia and elsewhere: The *aëriform* fluid which is exhaled from animal bodies in a state of putrefaction, acts, at certain times, more powerfully than at others, and is, indeed, in *one stage of the process, infinitely more noxious than any other elastic fluid yet*

*discovered.* Dr. St. John informs, that he knew a gentleman who, by slightly touching the intestines of a human body beginning to liberate this corrosive gas, was affected with a violent inflammation, which, in a very short time, extended up almost the entire length of his arm, producing an extensive ulcer, of the most foul and frightful appearance, which continued for several months, and reduced him to a miserable state of emaciation. He mentions, also, a celebrated professor, who was attacked with a violent inflammation of the nose and fauces, from which he, with difficulty, recovered, by stooping, for an instant, over a body which was beginning to give forth this deleterious fluid. Hence he infers, that the same gas, modified or united with others, may be the occasion of the *plague*, which has so often threatened to annihilate the human species.

In the war of 1755, in Germany, a destructive fever prevailed, attributed then to an infection of the air, by the putrid effluvia from the vast numbers killed in battle, and also to a calm in the atmosphere for a long time.

When Mr. Holwell, with 145 others, was imprisoned in the black hole at Calcutta, after passing a night in that dismal habitation, he found himself in a high putrid fever. The greatest part died before the morning.

Van Swieten was thrown into a most distressful vomiting, from inhaling the effluvia discharged from a dead dog in the highest putrefaction, which lay in a river, the bridge of which he was passing.

The fever at Philadelphia, in 1793, was ascribed to the noxious effluvia of large quantities of damaged coffee in various parts of the city, and to fomites, containing the matter of the disease, brought thither by vessels from the West-Indies, and to a vitiated state of atmosphere, as its cause.

The mortality prevailing at Newbury-port, in 1796, was ascribed, as its most probable cause and origin, to a large mass of putrid fish, which tainted the atmosphere to a considerable distance round.

Thus we have a few of the many instances of the poisonous and deleterious effects of the effluvia of animal putrefaction, under certain states of the constitution. We have also seen, that the parts of the town where the disease first made its appearance, are, from situation, much exposed to filth and putrefaction of every kind. The deposit of the hides, beef, fish, &c. which afterwards became putrid, and the circumstances attending their removal, have been noticed. We have also stated, that the mode of living, in our populous towns, is favourable to the introduction of too much septon, or azote, into the system, thereby giving a tendency to dissolution and putrefaction of the fluids; and, that the



appearances of the atmosphere were such as denoted it to abound with noxious exhalations and heterogeneous matters, and to want the elastic principle, or oxygene. From all these facts and circumstances, it is concluded, that azote, or septon, in some shape or modification, in and out of the system, is, most probably, the matter and cause of all malignant or pestilential diseases, and especially of the yellow malignant fever we have been considering.

Every one that is read in modern chemistry knows what is understood by azote, or septon, and its properties. Thus much it may be proper here to state, that azotic, or septous gas, is always found to remain, after a quantity of common air has undergone the respiration of animals, the combustion or putrefaction of bodies; because, in all these cases, the pure air, or oxygene, is absorbed or condensed. Azote, or septon, perfectly saturated with oxygene, forms pale nitric acid; with a smaller portion, it constitutes the ordinary orange-coloured fuming nitrous acid; with still less, it becomes nitrous gas; and, when wholly uncombined with oxygene, is denominated azotic, or septous gas. 32 parts of azote, and 68 of oxygene, form *nitrous air*, which, of all the different species of air, from experiment, seems the most noxious to animal life. Azote, or septon, in its simple, uncombined state, has no attraction for oxygene, but when, by the action of caloric, or the electric matter, it is brought into combination, and becomes an acid; it then strongly attracts oxygene, and continues to absorb it till perfectly saturated; and thus it is that the pure part, or oxygene, of the atmosphere, being absorbed and combined into acid matters, is made insalubrious and pestilential.

It is found, by experiment with the eudiometer, that the upper region of the atmosphere actually contains a greater proportion of oxygene, and less of azote, or septon, than nearer the surface; and, for this reason, oxygene has a stronger affinity for caloric, concentrated in the sun as its fountain, and because respiration, combustion, putrefaction, and all those processes and mutations of substances which occasion the consumption of oxygene and superabundance of septon, are always on or near the earth's surface. (Vide Fourcroy, Chaptal, Gregory, &c.)

In hot seasons and climates, putrid diseases are common, because oxygene, which is the primary recipient of heat, or caloric, or caloric in its first combined or embodied state, is calorified and drawn up into the higher regions of the atmosphere, by which the animal system is deprived of the portion requisite for the processes of animalization. By reason of this deficiency, the carbone, hydrogen, &c. are not duly eliminated and thrown off; the azote is not duly combined, assimilated, and wrought into animal fibre. Thus the materials composing the mass of fluids become more and more heterogeneous, unrefined, and unneutralized; and thus

the constitution assumes the tendency or predisposition to putrefaction; this is also assisted by heat or caloric acting upon and pervading the system from without, which, by its great stimulation, deranges the organic motions, making the animal secretions too rapid and abundant, and often superseding them by chemical combinations and processes. Hence the propriety, in order to prevent putrefaction, of using, for food and drinks, such as are in a neutral and unforced state, and which long resist putrefaction in themselves, that the animal powers may not be too much exerted or impeded, having already suffered from the excessive stimulation of external heat. That food is undoubtedly the best which raises the least internal heat and commotion. It may also be proper to take, as preventatives, such medicines as will invigorate and consolidate the animal fibre, and, at the same time, oxygenate the system.

Active inflammations are complaints which are found to prevail in the colder seasons, and for reasons the reverse of those above-mentioned; viz. because oxygene *abounds* in the atmosphere, by which it is homogenized, condensed, clarified, and rendered more elastic; and this, because it is not acted upon, and drawn into the superior regions, by the sun's perpendicular rays. Oxygene being thus concentrated, and brought nearer the surface of the earth, is absorbed by respiration, &c. in too great abundance; its agency becomes excessive; too much is embodied in the animal fibre; the vessels and organs are rendered turgid, and inflammation is the consequence. Hence the reason animal food is more coveted in winter than in summer.

Many plans have, at different times, been proposed for clarifying and preserving the purity of city atmospheres; but most of them have been either too partial and limited, or ill timed, and so reluctantly executed as that the expected good effects have not been realized. The exertions hitherto made have failed, and no barrier has yet been opposed sufficient to suppress this death-working disease. It still boldly stalks among us.

It is remarked by Dr. Mitchill, that large cities have generally been afflicted with pestilential diseases, until privies, grave-yards, and nuisances were removed, sewers constructed, and aqueducts completed.

Frequently agitating the atmosphere serves greatly to preserve its purity. Sprinkling and watering the streets and houses (but only where the sun has access) will have this effect. It will serve also to absorb and neutralize those acid particles that may have collected in the atmosphere in consequence of great heat, and by the aid of putrefaction. Docks and stagnant waters are rendered wholesome by strewing them with *caustic lime*. This was tried here (Boston) with apparent benefit. But the most certain and

effectual way to guard against disease, is a strict attention to diet and the habits of body. The matter of disease, I believe, is more frequently generated *in* than *out* of the body. A light, easy, vegetable diet is the most proper; meat highly injurious, because it corrupts the fluids, and renders them liable to putrefaction, from any slight interruption of the animal functions. Ardent spirits are pernicious. All exercise of body and mind should be temperate, orderly, and methodical. Our delights and enjoyments should be prescribed by reason and regulated by prudence, not by the extent of appetite, passion, or desire. They should enliven and invigorate, not depress and exhaust.



## ARTICLE V.

*A Letter to Dr. JOHN MACLEAN, Professor of Mathematics and Natural Philosophy in Princeton College, New-Jersey, by JAMES WOODHOUSE, M. D. Professor of Chemistry in the University of Pennsylvania, &c.*

SIR,

AS there are several assertions, in your examination of Dr. Priestley's considerations on the doctrine of phlogiston and decomposition of water, relating to some important parts of chemistry, which are absolutely erroneous, I think it necessary to call your attention to the subject.

As you wrote your dissertation expressly to prevent the youth of Princeton college from falling even into temporary delusion, and as public controversy is always favourable to the cause of truth, you can have no rational objection to this letter.

A judgment may be formed how well you have accomplished your purpose, and what right you have to condemn the experiments of Dr. Priestley in the authoritative manner you have done, having made none yourself, from the following particulars. You are not yet, Doctor, the conqueror of this veteran in philosophy.

You agree with the French chemists, that turbith mineral is an oxyde of mercury, and have asserted, that any substance into which it may be converted by a red heat, does not require any addition to constitute it a metal.

Now, the very contrary of this is true; for we have the most conclusive proofs, that turbith mineral is not an oxyde, but a sulphate of mercury.

1st. If pure turbith mineral is exposed to a red heat, in a long glass tube, a quantity of the sulphate of mercury, of a white colour and strong acrid taste, sublimes from it, and adheres to the sides of the vessel.

2dly. If a solution of caustic pot-ash is boiled upon the turbith, it suffers a considerable loss in weight, and loses its bright yellow colour, and is converted into a calx of the colour of brick-dust. The solution, by spontaneous evaporation in the open air, will yield chrystals of vitriolated tartar.

3dly. If distilled water is boiled upon the turbith, and renewed from time to time, the water will always precipitate a solution of muriated barytes.

These experiments incontestibly prove, that turbith mineral is not an oxyde, but a sulphate of mercury.

It is no objection to this opinion, that the turbith, when exposed to a red heat, yields oxygenous gas, and that running mercury is obtained; for the sulphuric acid leaves one part of it and joins to another, which sublimes in the form of a white salt. That part which the acid deserts is converted into an oxyde, is revived without addition, and yields pure air.

This sulphate of mercury is the supposed calx to which Dr. Priestley refers. It is sometimes obtained of a red colour, owing to some substance which deprives a part of the sulphuric acid of its oxygenous gas, and converts it into sulphur, which, uniting with the fluid mercury, sublimes in the form of cinnabar, and gives the whole of the salt a red colour.

This is what you ought to have ascertained, if you intended to have acquired the character of an accurate investigator.

Your next assertion is, that red lead contains more oxygene than a calx of iron, from which circumstance you suppose, that the former calx oxygenates the muriatic acid, and the latter does not, as it contains but a small quantity of pure air.

Your words are, "It certainly does not follow, because muriatic acid can separate a certain portion of oxygene from lead, when this is combined with a *great quantity* of this substance, that it should likewise separate oxygene from iron, when this is united to a comparatively *small quantity*."

You will grant, that when a pure metallic calx is heated in hydrogenous gas, that the oxygene of the calx unites to the hydrogen, and forms water; consequently, those calces which make the greatest quantity of inflammable air disappear, contain the most oxygene.

Having heated one drachm of red lead by a burning lens, eleven inches in diameter, in hydrogenous gas, obtained from the sulphuric acid, diluted with water, and malleable iron, and which had been well washed in lime-water, it made ten ounce measures of the air disappear.

One drachm of the precipitate of iron, from green vitriol by ammoniac, or a solution of mild pot-ash and the common rust of iron, heated in the same manner, made thirty-six ounce measures of the air vanish. One drachm of the filings of bar-iron, melted in oxygenous gas, absorbed twenty-six ounce measures of this air.

One hundred grains of well dried red lead, according to Lavoisier, contain 89. 93 metal, and 7. 64 oxygene; and the same quantity of the precipitate of iron, from green vitriol, by caustic pot-ash, according to Gadolin, contains 58. 48 metal, 15. 91 oxygene, 25. 39 water. One hundred parts of the yellow calx of iron, according to Lavoisier, 68. 66 metal, and 32. 34 oxygene.



Your opinion, then, according to these experiments, in regard to the quantity of oxygen which the calces of iron and lead contain, is void of foundation.

The true reason that red lead will oxygenate the muriatic acid, and that a calx of iron will not, is that the former readily gives its oxygen to the acid, and the latter does not, owing to a difference in the elective attractions subsisting between the acid, oxygen, and the two metals.

It is evident, that the oxygenation of the muriatic acid does not merely depend upon the quantity of oxygen contained in the calx; for one drachm of manganese, which has been exposed to a red heat, and parted with most of its pure air, will oxygenate the acid to a greater degree than an ounce of the calx obtained from boiling a solution of caustic alkali upon turbith mineral, which contains thirty times the quantity of oxygenous gas.

You have also declared, that Dr. Priestley is mistaken, in saying that finery cinder will not acquire rust, and assert that it contracts rust sooner than common iron.

To determine this question, a quantity of the scales which the blacksmiths strike off from red-hot iron, reduced to an impalpable powder, were exposed to the action of the air more than twelve months, and were sprinkled with water several hundred times, and, at the end of this time, were as free from rust as when first exposed.

The rust which finery cinder appears to contract is owing to iron-filings, with which it is frequently mixed. The pure scales never will acquire rust; for, when bar-iron is converted into finery cinder, it parts with the small quantity of coal it contained, and absorbs oxygen and water.

You have answered the Doctor, on this part of the controversy, by informing him, that inflammable air is a constituent part of other bodies besides water; that hydrogen is retained, with great force, by coal; that unglazed earthen vessels absorb moisture; and, lastly, you tell him in what manner the experiment ought to have been performed, and declare that it is of no value, as reported in his experiments on different kinds of air.

I have repeated this famous experiment, and the result is exactly as stated by Dr. Priestley.

One ounce of the scales of iron, and the same quantity of charcoal, were separately exposed, in two covered crucibles, in an air-furnace, well supplied with fuel, for five hours. They were then taken out of the fire, and mixed, while *red-hot*, in a *red-hot* iron mortar—were triturated with a *red-hot* iron pestle, formed of an iron ramrod—were poured upon a *red-hot* piece of sheet-iron, and instantly put into a *red-hot* gun-barrel, which was fixed in one of Lewis's black lead furnaces, and communicated with the

worm of a refrigeratory, a part of a hydropneumatic apparatus. Immediately after, luting the gun-barrel to the worm, one hundred and forty-two ounce measures of inflammable air came over in torrents, mixed with a tenth part of carbonic acid gas.

This experiment has puzzled every person to whom it has been mentioned.

For my part, I do not think it affects the antiphlogistic system; for the scales of iron contain water, and retain it in so obstinate a manner as not to part with it upon the application of heat; but when coal is added to the finery cinder, it takes away the water, by having a greater affinity to it than to the calx of iron. The coal decomposes this water; its oxygene unites to part of the coal, and forms the carbonic acid; while its hydrogen is separated, dissolves another part of the coal, and forms the carbonated hydrogen gas.

Dr. Priestley's explanation of this experiment is very unsatisfactory; for he says, the phlogiston of the charcoal contributes to revive the iron; but the Doctor ought to have remembered, that an oxyde of iron cannot be revived in one of Lewis's small black lead furnaces.

There are other substances besides finery cinder, which, when mixed with coal which has ceased to yield air, give inflammable air in large quantities. It may be obtained from any precipitate of iron or zinc, or from the flowers of zinc mixed with red-hot coal; and the hydrogen gas procured will always be in proportion to the water which the calces contain, and the metals will not be revived.

Should you consider the objections of Dr. Priestley once more, and advance nothing but what is founded upon your own experiments, you may hear from me again; and I promise not to be the first to drop the subject.

Mere assertions only serve to fix errors deeply in the mind, and do not advance the cause of truth.

Hoping that I do not intrude upon the precious moments of your time, which is "*more agreeably, and, perhaps, more usefully employed,*" than in discussing this subject,

I am, Sir, with consideration,

Yours, &c.

JAMES WOODHOUSE.

Dr. JOHN MACLEAN.

## ARTICLE VI.

*An Account of the Pestilential Disease, which prevailed at New-London (Connecticut), in the Summer and Autumn of 1798; communicated in a Letter from the Rev. HENRY CHANNING to Dr. MITCHILL.*

*New-London, January 17, 1799.*

SIR,

YOUR request that I would make such communications to you respecting the late pestilential disorder in this city, as might aid your researches into its origin, &c. in the United States, was communicated by Mr. Stewart, in his letter of December 19th.—I have been prevented, by the severity of the season, and many avocations, paying an earlier attention to your wishes.

I continued in the city during the prevalence of the disorder; yet, not depending entirely on my own observation during that period, I thought it advisable to consult with gentlemen who had more extended means of information than myself. I accordingly requested Dr. Coit, Dr. James Lee, Mr. Woodman, and Mr. Holt, two members of our worthy and indefatigable committee of health, to meet, and conferred with them upon the subject.

We ascertained, with a precision to be relied on, that the whole number of persons whose complaints clearly indicated the pestilential, or, as it is called, the yellow fever, did not exceed 246: and I give it you as a very important fact, on which you may rely, that, of the above number, 231 cases were clearly traced to the spot where the sickness commenced, that is, the patients were conversant, or had been in that part of the city a few days before they were seized. The part in which the septic gas appears to have been so highly concentrated, extended sixty rods north and south, about thirty rods each way from the house first affected, and about twenty rods west, being bounded easterly on the harbour.

As we have not even a shadow of ground to suppose the disorder was not of domestic origin, we are urged critically to investigate the cause within ourselves. I confess that, at the time when my fellow-citizens began to take the alarm, I could not admit the idea, that a pestilential disorder could originate and progress in a place so happily situated as this; for, added to an elevated situation, with scarcely any low lands to generate marsh-miasma, we have a deep, spacious harbour, near the sea, from

which we are favoured with refreshing sea-breezes through the summer. And, indeed, as might be expected, this city has ever been famed for the purity of its air, and health of the inhabitants. But I have been constrained to admit, that, under the influence of summer heats, exceeding, in *intensity* and *duration*, what has ever been experienced by the oldest inhabitants, some latent cause has been brought into action, and generated a disorder new and truly alarming.

As almost all the cases which occurred are clearly traced to a communication within the above-mentioned limits, and as scarcely a single person escaped the disorder who resided in that part of the city, there alone must we look for the cause which, under the providence of Almighty God, produced this dreadful scourge.

It appears that there was a large quantity of dried fish, in a bad state, in four or five stores, within twenty or thirty rods of each other, and all in the limits referred to. These fish were taken in the Straits of Bellisle, which being a high northern latitude, they were cured with a much less quantity of salt than usual. They were brought to this port in the autumn of 1797. The heat of the summer having been very great, many of these fish were found to be in a moist, slimy state, early in August last. From a quantity lying in bulk, in a store occupied by Mr. Jones (who fell a victim to the epidemic), a quantity of green and yellow purulent matter ran upon the floor. It was thought by the owners, that if they were spread in the sun, in the open air, the fish might be preserved; which was done, extending them a considerable distance in the street and wharves. While thus exposed to the excessive heat of the sun, with light winds, the effluvia in the neighbourhood were very offensive, as I have been informed by many gentlemen who passed in that street at the time. It was also noticed, at other times, that people were assailed with a very nauseous stench in passing through that part of the city. Whether this proceeded from the fish, or a quantity of whale-oil which was in the same store, or from the overflowing vault of an old privy, which belonged to the family first attacked, and was very offensive, I cannot ascertain.

It is to be particularly noticed, that the heat of the last summer exceeded, both in intensity and duration, what has been known within the memory of the oldest inhabitants. This excessive heat was attended with an unusually dry atmosphere, no thunder showers, light winds, and calms in the day, and calm nights, for five or six weeks successively, with the exception of a few nights.—As the degree of heat, with the prevailing state of the air, may be considered as important, in the course of your investigation, I shall subjoin my observations, taken from Fahrenheit's thermometer, placed in the open air, at the north end of the house,

about eight feet from the ground. These observations were continued to August 28th, when Mrs. Channing's illness having become very distressing, and closing in her death, September 6th, I was prevented attending further to the subject.

Before I close my letter, I would mention a particular case, which may be considered as very clearly pointing to the fish, as a principal, if not the only cause of this distressing epidemic. A captain of a coasting vessel, belonging to this place, took in about twenty quintals of the fish from three of the stores, on the 21st or 22d of August, and sailed for Hartford. He had them packed in hogsheads there, and delivered, on the 3d of September, on board a boat bound to a town in Vermont. The fish were very soft and moist, and were very disagreeable while on board the vessel. On the 8th of September, in the night, he was taken ill, and reached home on the 9th; and his illness proved a serious attack of our pestilential fever.

I have thus endeavoured to give you, in detail, all the facts of which I am possessed, which may cast some light upon the very important subject of your researches. May Heaven prosper your exertions, direct us to the means of safety, and deliver us from this pestilence, which has hitherto walked in darkness!

I am, Sir,

Your obedient servant,

HENRY CHANNING.

P. S. Dr. Coit informs me that he wrote you, before our conference, upon the subject, and mentioned, that there were only two cases which could not be traced to the limits I have mentioned. He desires me to observe, that the other cases were discovered afterwards. Yet, I would add, of those cases which we could not trace as originating in the infected spot, several were under a strong probability that this was the case.





ARTICLE VII.

*Second Letter from the Rev. Mr. CHANNING, on the same Subject, dated New-London, February 19, 1799.*

SIR,

I WROTE you the 17th of January last, and stated such facts as I conceived important in assisting your investigation of the causes of our late epidemic. I then mentioned that a very nauseous effluvium was frequently noticed in that part of this city where the epidemic began and prevailed. When I wrote, I could not ascertain, as was observed in my letter, whether this effluvium proceeded from the putrid fish, whale oil, or the overflowing vault of an old privy, belonging to the house where the first patient died. Since writing, I have more carefully examined the premises, and am satisfied that the stench proceeded from the *privy*. It was placed upon the side of a hill; on one side the vault was stoned eight feet *above ground*, on another side five feet, on the other sides the walls were enclosed by the earth. From the two sides which were above the surface of the earth, the filth oozed out constantly, and was noticed, by those who went near it, to be very offensive during the calm weather, with drought and intense heat, in August. This was, doubtless, one of the causes which rendered the air, in that part of the city, unfit for respiration. Yet I still think the *putrid fish*, in a store within one rod of the *privy*, and in other stores within twenty-five or thirty rods of it, were the most powerful causes in producing the deleterious effects which were experienced. In addition to what I have before communicated, I would give one or two facts, corroborating the idea, that the fish was a principal cause. Mr. Williams, of Stonington, who has been, for many years, acquainted with the state of fish, in different stages of curing, passed through the street in August, when a quantity of the fish, in the state before described, was spread, to be dried, in the open air: he remarked a very disagreeable effluvium, evidently proceeding from the fish, but very different from what he had ever observed to proceed from fish before. His health soon failed, and, for four weeks, he felt unusually affected, and was persuaded his complaint proceeded from the smell of the fish. A gentleman of this city, one of the medical profession, attending an auction where the fish were spread in the open air, was seized with nausea from the smell of the fish, and was obliged to leave the spot.

Assuredly, my dear Sir, my exalted opinion of this city, as the seat of health, gave every advantage to the opinion of foreign

origin, as the source of our late epidemic. But, looking in vain for corresponding facts, I am constrained to yield to opposing evidence. However, I am fully convinced, that, had not last summer exceeded what has ever been known before, in *long-continued* and *intense heat*, with no thunder or rain, and *light winds* and *calms*, neither the fish, in its bad state, nor any other subordinate cause, would have produced our epidemic.

I am, Sir, with sentiments of esteem,  
Your obedient servant,  
H. CHANNING.

*Meteorological Observations, from Fahrenheit's Thermometer, in the open air, North Shade, New-London, 1798.*

July 28th, at M. 92°      1 P. M. 95°      3 P. M. 88°  
29th,                      89

August 3, 4, 5, 6, and 7, no observation—only intense heat.  
8th,                      at M. 89°

9th, at 10 A. M. 90°      93      3 P. M. 97°      5 P. M. 93°  
10th,                      90      92      2 P. M. 94      3 P. M. 92

*Remark.* Upon removing the thermometer within the chamber, the mercury descended from 92 to 89° in fifteen minutes, and continued descending.

August 11th, at 10 A. M. 90°      M. 87°      3 P. M. 87°

*Remark.* The heat has been intense for a fortnight past, and has been attended with very dry weather upon this part of the coast—only one thunder-shower having occurred in the time.

August 12th, at 10 A. M. 86°      M. 89°      3 P. M. 89°  
13th,                      85                      92                      87

14th and 15th, heat not so intense. In forenoon of  
15th, showers without thunder.

16th, at 10 A. M. 86°      M. 87°      3 P. M. 86°

17th,                      85                      91                      87

18th,                      85                      87                      88

19th,                      80                      86                      89

20th,                      82

21st,                      87

22d,                      87                      84

23d and 24th,                      78

25th,                      88

26th,                      87                      92                      2 P. M. 94\*

27th,                      80                      82                      3 P. M. 87

28th,                      82

\* At 4 P. M. 88 within doors.

ARTICLE VIII.

*Additional Account of the Pestilential Fever which prevailed at New-London, (Connecticut); communicated in a Letter from Dr. COIT to Dr. MITCHILL, dated New-London, January 11, 1799.*

SIR,

WINTHROP SALTONSTALL, Esq. shewed me a letter from you, requesting a particular statement of facts, relative to the origin and cause of the yellow fever which prevailed in New-London the last summer. He requested me to communicate to you my observations thereon, which I the more readily comply with, as it is my ardent wish that the cause of so fatal a disease may be investigated; and I am happy to find, that a gentleman whose medical character and abilities are so justly and universally esteemed, has undertaken it. Although personally unknown, I have perused, with pleasure, some of your medical publications, and, from them, have derived such information as was of great advantage to me in the late pestilential fever. As to its local origin, I give you the following statement of facts, and leave it with you to determine.

Capt. Elijah Bingham, inn-keeper, living in Bank-street, which is a street next to the water, on which stand several stores near said house, and in the most populous part of the city, on the 26th of August last, died, after four days sickness. The symptoms were such as gave the alarm of yellow fever. A few days after his death, his wife, son, and daughter, were seized with symptoms of yellow fever, and died.

The day on which Capt. Bingham died I was called to visit two patients, who lived directly opposite, in the same street. Within four or five days after I was called to nine other patients in the same street, not more than eight rods from said Bingham's, all of the same fever—some of them violently seized. None of these died. In other houses, not more than ten rods south of said Bingham's, eight died. About thirty rods north of said house, about the same number died.

By this time the disease had spread into various parts of the town, which occasioned the removal of two-thirds of the inhabitants. We could not find any sick of the fever (two cases excepted), but those who had been either in Bingham's house, or frequented the spot from whence we concluded the infection originated, which, from our best observation, we have fixed thirty rods north and south of Bingham's house.

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We will now inquire what, within that space, could produce septic exhalations.—I have inquired of those whose business it was to examine every place where there was any collection of filth that appeared to be in a state of fermentation, and could discover nothing more within that space than in the other parts of the town, except a large quantity of imperfectly cured codfish (stored in bulk), confined in stores. In one store only, which was within fifteen yards of Bingham's house, fifty quintals were found in a state of fermentation, emitting a very disagreeable odour, part of which had been spread in the open air, round the stores and sides of the street, about eight or ten days before the appearance of the fever, after which the stores were kept shut till we had severe frost.

The above is all I can collect relative to the local origin of the fever. About a fortnight after the commencement of the fever, I was taken with it myself, and have not made any particular observations on the state of the atmosphere, &c. The Rev. Mr. Channing, who writes at this time, will give you his remarks.

I am, with esteem,

Your obedient servant,

THOMAS COIT.



## ARTICLE IX.

CURSORY OBSERVATIONS ON THAT FORM OF PESTILENCE CALLED *YELLOW FEVER*.*By* EDWARD MILLER, *M. D.*

**T**HE design of the following paper, as it is simple and definite, may be comprized in a few words. It is intended to combine a number of facts relating to the operation of poisons on the animal system, to compare them with the action of febrile miasmata, and to draw such conclusions concerning the nature, prevention, and treatment of pestilential diseases, as may appear legitimately to result from the comparison. The mode of illustrating the nature of fever, by considering its remote cause as a poison, leads to an interesting train of inquiry, and furnishes a great number of instructive and luminous analogies. It is not, indeed, pretended, that this view of the subject is, in any respect, new. Many of the most enlightened physicians have long since perceived this coincidence of facts, and have, accordingly, prosecuted the comparison to a considerable extent. It only remains, therefore, at present, to inquire whether this analogy may not properly be carried still further, and whether it will not suffice to unfold a number of intricate and important circumstances of that form of pestilence which has lately produced so much distress and mortality in the United States. If this comparative view of miasmata and poisons terminated merely in speculation, however curious or unexpected many of the coincidences might appear, the publication of it would scarcely accord with the existing solemnity of the subject; but, believing that many practical inferences, respecting pestilential epidemics, may be deduced from such a comparison of facts, I have thought proper to lay it before the public, in order to be corrected or approved by my medical readers.

To prevent misapprehension, it will be proper to state, that, at present, no discussion will be undertaken concerning the origin, domestic or foreign, of pestilential epidemics; the quality of contagion attributed to them; nor the precise chemical constitution of the morbid cause. These topics, though certainly of the highest concern to our country and to all mankind, have been so ably treated in many parts of this work, that it is the less necessary now to renew the consideration of them.

Before proceeding to an account of the operation of poisons



it will be proper to state some of the causes which prevent the general acknowledgment of the analogy between them and the infectious matter of pestilence. The first which deserves to be mentioned is the gaseous and invisible state of pestilential miasmata. When poisons are spoken of, they are generally understood to mean certain visible and palpable substances, of mineral or vegetable origin, or inoculated into the system by some venomous animal. The conveyance of any of those substances into the stomach, or the bite of the venomous animal, is considered as the signal of approaching mischief. And this relation between cause and effect is usually so obvious and uniform as to be recognized even by the most careless and ignorant part of mankind. All this, however, fails in the aerial form of the noxious power producing malignant diseases, which, in a great measure, escapes the observation of the senses, and is chiefly to be known by its effects. Another cause of overlooking the analogy contended for, is the more frequent suddenness of death from poisons, produced by the largeness of the dose, which stimulates beyond the point of fever, and quickly overpowers and extinguishes the operations of the vital principle. By diminishing the quantity to an appropriate amount, these noxious substances may be made to exhibit the course, duration, and nearly all the phenomena of what is called a malignant fever. But, above all, the attention of physicians has been diverted from this analogy between miasmata and poisons, by the febrile part of the character which generally belongs to pestilential diseases, and which, in common apprehension, is constantly connected with them. Yet these diseases are by no means universally accompanied with what is strictly called fever. There is often a degree of virulence in the Asiatic plague, in the yellow fever, and in all the other forms of pestilential and malignant diseases, which altogether transcends the process of fever, and extinguishes life in a more summary manner. In the worst cases, both of poison and pestilence, the febrile part of the symptoms excites little attention. After all our researches into the nature of fever, it seems primarily to consist in the stimulation by poison, miasmata, or otherwise, of a particular part of the system, and in the propagation of morbid affection afterwards, from the viscus or part originally invaded, to the heart and arteries, and other parts of the body. If this be just, according to the theory of a celebrated writer,\* fever is merely topical at first, and subsequently a disease of association. The morbid cause, how varied soever, whether contagion or miasma, whether alternation of temperature, or other noxious power operating in a similar way, appears always to act upon the same principle: it stimulates, directly or indirectly,

\* Dr. Darwin.

a particular portion of the system, in a less or greater degree; sometimes to the extent of common inflammation, sometimes to inflammation *sui generis*, then to more violent inflammation verging rapidly to gangrene, and, lastly, to the extent of paralysis. The part thus variously affected, through the medium of sympathetic association, propagates disease to other parts of the system, and especially to the heart and arteries. This association may be more or less comprehensive, and thereby render the fever more simple or compound. And upon certain peculiarities of structure, or the greater or less importance of the part primarily attacked, and upon the more or less compound nature of the disease, resulting from the extent of association, will probably depend the character of the fever, as to mildness or malignancy. Examples of this may be found in cases of pneumonia and yellow fever. In the former, a local inflammation of the lungs, the effect of exposure to alternation of temperature, excites febrile action throughout the sanguiferous system: in the latter, miasmata, received, as there is commonly reason to conclude, into the stomach, first attack that important organ, and, soon afterwards, draw into morbid sympathy various parts of the head, limbs, back, &c. then the heart and arteries, and, successively, many other parts of the body. Hence it appears that fever is originally local; and though, in its progress, it be extended over the whole body, we are still to regard it chiefly as symptomatic of the stimulus applied to a particular part. If a sword penetrate the abdomen, and transfix the stomach, the range of sympathy possessed by this viscus will draw on a train of severe consequences, such as pain, inflammation, fever, convulsions, gangrene, &c. In this case the convulsions and the fever are equally symptomatic of the wound; and, by attending principally to these, and overlooking the organic injury, we should act as is common in pestilential diseases, where the force and rapidity of the action of the blood-vessels are deemed of more importance than the local poison which inflames, corrodes, or paralyzes a vital organ.

After this digression, which, however, the reader will observe to be essentially connected with the business before us, it is proper to return to the operation of poisons. There can be little danger of a mistake of terms in the treatment of this subject; but, to prevent this, it may be observed, that the word poison is simply used to designate a substance which injures or destroys life by a small quantity, generally in a short time, and by a mode of action not obvious to the senses. These substances, according to their origin, are divided into mineral, vegetable, and animal; and, though much diversity will be observed in comparing them, yet there seem to be some general principles in which they all remarkably agree. To the divisions of poisons just mentioned, a fourth, viz.

the ærial, has been added; and if the opinion maintained in this paper has any foundation, the propriety of such addition will be sufficiently apparent. Indeed, according to this opinion, miasmata are truly poisons; but, for the sake of discrimination, the usual terms of distinction will still be preserved.

Of the mineral poisons it will be only necessary to mention a few, and such as most frequently fall under notice. The oxyd of arsenic (common white arsenic), the muriate of mercury (corrosive sublimate), and the acetite of copper (verdigrise), are familiar to every body. The effects of these substances, when taken into the stomach, are nausea, vomiting, burning heat and pain referred to the stomach, sense of distension, violent griping and burning pains of the intestines, which are sometimes costive, sometimes affected with purging; the discharge of a slimy and frothy matter, often mixed with blood, by vomit and stool; insupportable thirst, pains and cramps in the limbs, pains in the back, flushing of the face, the pulse at first full, strong, and frequent: in the progress of the disease hiccup and convulsions take place, hæmorrhages appear from various sources, the violent retchings become aggravated, attended, towards the close, with vomiting of dark-coloured or black matter\*—red or dark spots appear on the skin; sudden prostration of strength, weak pulse, tremblings, cold sweats and cold extremities commonly usher in death. A rapid putrefaction begins very soon after death, and renders speedy interment indispensable. Dissection discovers marks of violent inflammation and erosion of the stomach, and the collection of a large quantity of the matter of black vomiting. In cases where persons have survived the taking of poisonous doses of arsenic, the hair has been observed to fall off, and a jaundice of the worst and most obstinate kind has taken place.

The vegetable poisons are so numerous, and most of them so

\* A man took, by mistake, a drachm of white arsenic instead of cream of tartar. The usual symptoms came on—thirst, heat at the stomach, vomiting, hiccup, weak, slow, and intermittent pulse; the matter puked up bilious and dark-coloured: on the fourth day he was attacked with hæmorrhagy; on the seventh he was affected with violent priapism; on the eighth he was seized with more distressing anxiety—his pulse was febrile, full, and intermittent—convulsions came on—delirium and death. On dissection, the stomach was found deprived of the villous coat, and full of a black liquor, which deposited a sediment like powdered charcoal.

See *Nosologie Methodique de Sauvages*, tome iii. p. 112.

Similar cases, especially as to black vomiting and the other more important symptoms, may be found in Wepfer (*Historia Cicutæ Aquaticæ*), in Morgagni (*De Sed et Causis Morb.*), and in many other writers.

A fatal case of poison by arsenic also occurred, some time ago, in the New-York Hospital: few of the circumstances can now be recollected; but black vomiting came on—and the patient died about the sixth day.

well known, that it is unnecessary, at present, to recount them. They produce, when taken in a given quantity into the stomach, high febrile action, heat and redness of the skin, especially of the face, neck, and breast, redness and despondency of the eyes, furred and dry tongue, anxiety and restlessness, sense of heat and sickness at stomach, vomiting, oppression and pain about the præcordia, pain in the head, giddiness and staggering, delirium, hiccup, convulsions, subsultus tendinum, dilatation of the pupils of the eyes, stupor, sometimes yellowness of the skin, hæmorrhages, black vomiting, black and pitch-like stools, &c. and after death, sometimes before, livid spots are observed on the body, the appearance of the blood is dark and dissolved, and putrefaction speedily takes place.\*

The animal poisons are generally communicated by means of the bite or sting of the venomous animal. They induce a variety of phenomena which it is not necessary minutely to state. The bite of the poisonous serpents is generally followed by tumor, and livid colour of the part bitten, extravasation of dark-coloured blood into the adjacent cellular membrane, nausea and vomiting, sudden prostration of strength, paralysis of the limbs, convulsions, yellowness of the skin, hæmorrhages, &c. Livid appearances of the body, a dark-coloured and dissolved state of the blood, and a rapid putrefaction, are observed after death.†

The most transient consideration of the symptoms just recited cannot fail to impress the reader with the striking analogy between the operation of poisons and the miasmata and contagions which produce epidemic and pestilential diseases. Scarcely a single symptom belonging to malignant distempers can be mentioned, which does not also appear as a consequence of the reception of poison; and, particularly, the most deadly symptoms observed in the one form of disease, are also found to be common to the other. It may be objected that the deleterious effects of poisons are not so regularly attended with febrile appearances, as our pestilential epidemics. But, in answer to this, it should be observed, that the irregularity of malignant and pestilential diseases, with respect to the circumstances of fever, has been always remarked by the best practitioners; that the absence of the cold stage at the beginning, and of the hot stage of fever afterwards, is remarked among the signs of malignancy; and that some of the worst cases, instead of frequency of pulse and increased heat, exhibit a wonderful reduction of both. The conclusion, therefore, is, that only the lighter cases of pestilence are unlike the effects of poison; and that in proportion to the degree of malignity the resemblance grows

\* See Wepfer (*Historia Cicutæ Aquaticæ.*)

† Fontana (*Treatise of the Venom of the Viper.*)

stronger. It must be admitted, indeed, that the gross matter of mineral poisons often acts upon the alimentary canal, especially in its first operations, after a manner which cannot be predicated of the subtle form of miasmata; but progressively the difference is much reduced; and, towards the close of these diseases, is nearly lost.

The morbid condition of the stomach, induced by all the mineral and vegetable poisons received into that organ, and in like manner by the miasmata of pestilence, seems to be the original source of the analogy now attempted to be established. All these noxious powers, however various in constitution and origin, concur in possessing a stimulant operation so violent as to cause inflammation, paralysis, or decomposition in this vital part. The effect of such a stimulus on the alimentary canal itself, will readily explain all the symptoms of irregular action which take place in that organ; and the sympathetic associations of the stomach with other parts will explain the affections of the head, limbs, &c. as well as the rapid exhaustion of the principle of life so often observed.

There is one remarkable phenomenon in the history of yellow fever, which seems to have no parallel but in the operation of poisons received into the stomach. I mean the retrocession of the high febrile and inflammatory symptoms of the disease, which often takes place about the third or fourth day, and leads the inexperienced observer, and the deluded patient, to confide in the hopes of recovery. If any symptom can be said to distinguish the yellow fever from other forms of pestilence, this deserves, perhaps, the most to be selected; and the cases related below, would lead to a belief, that certain mineral and vegetable poisons operate in a very similar manner.\*

\* A physician of this city, some time ago, was requested to visit a child, who, by mistake, had swallowed a strong solution of the muriate of mercury. Some barley-water, which happened to be at hand, was immediately given in large quantity, and the contents of the stomach were ejected, by vomiting, within four minutes after swallowing the poison. The following night the child passed a good deal of blood by vomiting and stool, succeeded by violent griping pains. On the second day these symptoms had entirely gone off; but some fever and cough (a complaint which the child laboured under before taking the poison) had returned, for which a demulcent remedy with laudanum, was ordered. On the third day the fever and cough were so severe that it was thought proper to apply a blister to the sternum. After this all complaints vanished, and the child appeared to be fast recovering. When this favourable state had continued some time, the patient began to vomit a dark-coloured matter—the pulse became more frequent, irregular, and weak—the intellectual functions were impaired—convulsions soon succeeded—a frantic delirium came on—and death took place on the fifth day.

A young woman dined upon a dish containing a poisonous species of mushroom (*Agaricus Clypeatus*, Lin?) In the afternoon she was attacked



The evidence of dissections strongly confirms the similarity of the operation of poisons and miasmata. By these it appears, that in yellow fever the stomach and duodenum generally sustain the first and most violent impression of the miasmata; that they suffer, by means of this stimulus, inflammation, paralysis, or corrosion; and that they exhibit a destruction of the villous coat, and an accumulation of black matter, exactly resembling those which arise from the mineral poisons.\* The morbid appearances ob-

With cardialgia—in the evening she felt acute pains—nausea and vomiting came on, attended with bilious stools and great prostration of strength. On the second day her pulse was frequent and small, and the epigastrium was swelled. Demulcent remedies, fomentations, and clysters were ordered—many stools were procured, and several pieces of the mushroom discharged. On the third day the cardialgia and debility continued. On the fourth day the patient was easy through the night—the skin was moist, and the pulse better; and, after taking some further remedies, she voided more of the mushroom; the symptoms then abated, and she slept. On the fifth day she was seized with delirium, oppression of the breast, sighing, anxiety, &c. her pulse failed—she refused all remedies—her extremities became cold—the difficulty of breathing increased—she was seized with locked jaw—and yellowness appeared on some parts of the skin. On the sixth day the patient died. On dissection, the stomach was found to be affected with inflammation, the duodenum distended with flatus, and the bile of the gall-bladder green and black.

See *Neslogie Methodique de Sauvages*, tome iii. p. 115.

The following case, related by Dr. Percival, proceeded so insidiously as to deserve to be mentioned here; though for the sake of rendering it brief, much of the detail is abridged.—A young lady ate a large quantity of pickled samphire—this produced pain in the stomach and eruption on the skin—she was affected with shooting pains over the body, was dejected, restless and very thirsty—her pulse was frequent and small, the tongue covered with a white fur, and she passed several days without a stool—on the 6th day, vomiting came on, preceded by hiccup—on the 7th the retchings became incessant, and the discharges of a green colour and very offensive—progressively the discharges, both by stool and vomiting, were more and more offensive, and the latter assumed a dusky green colour—upon using some remedies the symptoms were suspended, but in 24 hours the vomiting returned, the extremities became cold, and she expired on the 10th day.—On dissection, about a quart of brown and fetid liquor was found in the stomach; the internal coat of that organ was inflamed and gangrenous, particularly about the *cardia* and *pylorus*; and this appearance extended itself some way down the *duodenum*.—By the usual chemical tests, the pickled samphire was found very strongly impregnated with copper.

See *Essays Medical, Philosophical, and Experimental*, vol. ii. p. 122.

\* The stomach and the beginning of the duodenum are the parts that appear most diseased. In two persons, who died of the disease on the fifth day, the villous membrane of the stomach, especially about its smaller end, was found highly inflamed; and this inflammation extended through the pylorus into the duodenum some way. The inflammation here was exactly

served in other viscera, and especially the effusions of blood and serum, seem more probably to result from the general violence of arterial action; and the livid and black spots which are often discovered on the lungs and elsewhere, correspond with similar spots on the lungs of animals that die of poisons, and which are ascribed to the universally morbid state of the blood. The burning heat in the stomach, as well as the nausea and vomiting, at the attack of yellow fever, the strong traces of inflammation in that organ when laid open to view, the injuries of the villous membrane, the black matter overspreading its surface, and the extension of these morbid appearances to some distance in the duodenum, all seem to denote the presence and immediate application of *virus* to the coat of the stomach. Other circumstances also corroborate this opinion. The obstinate costiveness which appears at the beginning of the disease, the deficiency of bile in the violent cases, and, finally, the scantiness and viscosity of that liquor, discovered in dissecting the gall-bladder, must, I conceive, be attributed to excessive stimulation, and, of consequence, to a morbid degree of absorption in the alimentary canal. It may be objected to the opinion of the operation of miasmata in producing inflammation, paralysis, or corrosion in the primæ viæ, that symptoms characterising these affections do not always appear in yellow fever, and that sometimes they do not appear at all, in cases where the greatest organic destruction of the stomach had taken place. But it may be replied that nothing is more probable than fallacy on this subject. Inflammation, in the most fatal degree, may exist in the stomach without fever, pain or vomiting;\* and paralysis may be produced in that organ, in a moment of time, without being perceived.† A cancerous affection of the stomach has been found, by dissection, to exist, which had never been indicated by nausea or retchings.‡

similar to that induced in the stomach by acrid poisons, as by arsenic, which we have once had an opportunity of seeing in a person destroyed by it.

See *Dissections by Drs. Physic and Catbrall, in Dr. Russ's Account of the Yellow Fever of 1793*, p. 120.

The internal part of the stomach and duodenum is sometimes reddish or yellow, but often blackish; the tunica villosa very easily separating, even with the touch; the other guts much in the same state: but, in general, the two first most affected. In the stomach there is often a thick mucus, with the same black stuff that is thrown up by vomit: if the villous coat is not much affected, the mucus prevails; but if otherwise, the black vomit. Farther down the guts, the black stuff is thicker and more viscid, almost resembling tar; and, in the great guts, it is often mixed with clotted blood.

See *Hunter's Diseases of the Army*, p. 201.

\* Cullen's First Lines, vol. i. p. 205.

† Zoonomia, vol. iii. (American edition), p. 269.

‡ Duncan's Medical Commentaries, vol. iii. (2d Dec.), p. 146.

And Morgagni (*Seats and Causes of Diseases*, vol. iii. p. 374.) relates a case of a dose of arsenic proving fatal, where no inflammation, erosion, or other mark of mischief, appeared in the stomach; yet the poisonous material was actually found in contact with the coat of the stomach, was verified by the usual chemical and other tests, and one of its effects displayed in the appearance of livid maculæ on the skin.

Dr. De Witt, in a very judicious account of the poisonous effects of the datura stramonium (see *Med. Rep.* vol. ii. p. 30), has noticed the resemblance of these effects to the symptoms of malignant fevers.

The production of yellowness of the skin by certain poisonous vegetables, and by the bite of spiders, serpents, &c. (see *Nosologie Methodique de Sauvages*, tome iii. p. 448), as well as in malignant fevers, is a striking proof of the same analogy.

The relation which the disease produced by the bite of a rabid animal bears to malignant fevers, is ably illustrated by Dr. Rush, in his observations on the nature and cure of hydrophobia. See *Medical Inquiries and Observations*, vol. v.

The condition of the blood, as inspected after the operation of poisons and miasmata, affords strong evidence of the similarity of their effects. The most distinguished compilers of facts on the subject of poisons, such as Wepfer, Mead, Fontana, &c. generally represent the blood, after the system has been acted upon by mineral, vegetable, and animal poisons, as morbidly thin, dark-coloured, and indisposed to the usual manner of coagulation. That a similar state of the blood is generally found in the malignant cases of yellow fever, will not be denied. The livid maculæ and universal duskiness of the skin, the hæmorrhages from various sources, and the rapid putrefaction of dead bodies, are all common effects of miasmata and poisons: and that the latter, especially, is a common consequence of the operation of a violent stimulus, is proved by its occurrence after death by lightning, the fatigue of the chase, &c. The subject, however, of the morbid changes of the blood, has not been sufficiently explored; and may be expected, hereafter, to yield important instruction concerning the action of these noxious powers.

Flushing of the face, neck and breast, redness of the eyes, and heat in the eye-balls, are remarkable symptoms at the beginning of yellow fever. They are the usual effects of vegetable and other poisons taken into the stomach. They are observed, in a considerable degree, after taking many stimulant substances, not poisonous, into the stomach; and redness of the eyes, especially, is a well known consequence of the intoxication of opium and ardent liquors. It seems to be the effect and sign of a want of absorp-

tion in the capillary veins, induced by an exhaustion of vital power, from the operation of some excessive stimulant.

It was before stated, that a falling off of the hair has been a frequent consequence of the poison of arsenic. The occurrence of the same thing after malignant fevers, deserves to be recollected in this comparison of these diseases.

Among other consequences of an excessive dose of arsenic mentioned before, is a liableness to frequent attacks of jaundice. A gentleman, previously remarkable for his athletic powers, was nearly deprived of life by this poison, and afterwards exhibited all the appearances of a broken constitution. Soon after this misfortune he was seized with a disease of the liver, followed by paralysis; and thenceforward was subject to jaundice four or five times every year.

The analogy between the miasmata of pestilence, and mineral as well as vegetable poisons, will likewise appear interesting, if we consider the passages by which they gain admittance into the body. Three passages have been assigned for the reception of miasmata; that by the lungs in respiration—another by the cutaneous absorbents—and a third by the œsophagus and stomach. The reception by the lungs would appear probable at first view, and, from the actual approach of yellow fever under the form of catarrh in many instances, no doubt can be entertained of the fact. But though miasmata may find entrance by the lungs, and many cases of pestilence be disguised by the mask of catarrh; yet we can by no means pronounce this the usual inlet of the cause of yellow fever. The cases of primary and continued affection of the lungs, in this disease, are comparatively rare. The continuance of any single portion of air in the vesicles of the bronchia must be necessarily short; and the quick return of it, aided by the exhalation of moisture which always accompanies the act of expiration, must greatly dilute and expel any matter of infection which had obtained admittance. The noxious gas probably adheres to the vapour of water wherever they meet, and thus the *halitus* of the lungs proves to be one of the best means of defence against this aerial poison.

That miasmata are absorbed by the skin, is rendered probable by a multitude of facts. The course of inflamed lymphatics has served to trace the conveyance of a fever-producing poison from a gangrene in the lower extremities. In a similar manner an old ulcer of the leg has been often known to furnish matter of infection, which passing upwards, excited a swelling in the groin, and a consequent fever.\* It is probable that the pestilence of the Levant is often communicated by cutaneous absorption, which affords

\* See Hunter's Diseases of the Army, p. 186.



the best solution of the glandular swellings in that disease, and leads to the supposition, that such swellings indicate the route of miasmata into the system, rather than any critical effort of nature to discharge them. Hence may be explained the efficacy of oil applied to the skin in this kind of pestilence. The oil not only destroys such miasmata as still adhere to the skin, but, pursuing and overtaking such as have found admittance into the lymphatics, it guards the system from the mischief which otherwise might ensue. There is ground to believe, that miasmata are heavy and sluggish, that they commonly lurk near the earth, and that they are most virulent near to their source. Hence we may account for Dr. Russel's fact of inguinal swellings occurring so much oftener in the plague than the axillary, parotid, cervical, and maxillary: \* hence, likewise, we may account for another fact mentioned by him, viz. that the inguinal bubo of the plague appears lower down the thigh than that of the venereal disease, and nearer to the crural vessels; and hence, finally, we may explain the appearance of pestilence in dogs, mules, and other animals holding their heads near the earth, sooner than in man. But as these glandular swellings rarely occur in yellow fever, it must be concluded, that the cause of that disease generally finds admittance into the system through some other route.

The comparative infrequency of pulmonary symptoms, as well as of buboes and carbuncles in yellow fever, compels us to seek for the route of the morbid cause in the œsophagus and stomach. If the evidence in favour of this opinion be duly considered, it will be difficult to avoid the conclusion. The first morbid sensations, at the approach of yellow fever, may be generally referred to the stomach, and to those parts with which the stomach maintains the strongest association of motions. In the progress of the disease, this organ continues to suffer far more than is usual in other malignant distempers: and, towards the close of the tragedy, black vomiting, the result of decomposition as well as of morbid secretion, and yellowness of the skin, the effect of virulence exerted on one of the nearest appendages of the stomach, furnish the two symptoms which, more than any others, have conferred on the disease its popular denominations. The miasmata of this form of pestilence, mixed with the saliva, over which the air in respiration wafts them, descend into the stomach; arrived there, they cannot be readily expelled, as from the lungs, by the alternate expulsion of air, and the envelopement of the halitus, which is incessantly discharged; but adhering to the coat of the stomach, and acting like a large dose of opium, or other violent stimulants, they speedily render the intestines costive, thereby preclude their pas-



sage down, and then proceed to execute the remainder of their pernicious work.

Upon the whole, it results, that yellow fever is not only the offspring of a deleterious poison, but that this poison is ordinarily received into the stomach; that the great vitality and extensive associations of this viscus sympathetically induce disorder in many other vital parts of the system; that the delicacy of texture and the irritability of the stomach, combined with the activity of the poison, lead to the inflammation, or other more summary processes, by which its organization is so rapidly broken down; and that, therefore, the yellow fever, being thus primarily and essentially a disease of the alimentary canal, and chiefly of the stomach, may, perhaps, be distinguished from the Asiatic plague, besides the differences of climate, &c. by the various modes in which the miasmata are received into the body; those of the former being less admissible by the skin and more readily missible with saliva, and those of the latter being just the reverse. The few exceptions which take place in the rare occurrence of black vomiting in the plague of Asia, and of buboes and carbuncles in the yellow fever, serve rather to confirm than to weaken the force of the general observation.

If the opinions concerning yellow fever, which are here maintained, be well founded, it follows, that the principal indications of prevention and cure will be, I. To arrest the entrance of miasmata into any part of the system, but particularly into the stomach. II. As much as possible to dilute, envelope, and carry speedily through the alimentary canal, all such miasmata as may unavoidably have gained admittance into it. III. At the first approach of morbid sensations, to evacuate, as speedily and completely as possible, the contents of the stomach and intestines. And, IV. To allay the violence of stimulation, and, as far as possible, to guard against the consequences of it. The limits of this paper will not allow a discussion of all the means suited to fulfil these indications: a few remedies only will be mentioned, and these in a desultory manner.

I. As it is impossible to prevent the admission of miasmata into the lungs, while we breathe air impregnated with them, and as, when received in that manner alone, they are probably less pernicious, our principal attention should be directed to the means of excluding them from the stomach. Dr. Rand, of Boston, in his excellent paper on this disease, republished in the appendix to this number, asserts that the air, in certain parts of the town, "was so fully impregnated with contagion, as to be very perceptible to the smell and taste;" and he adds, "exciting the same sensation in my mouth, as a weak solution of corrosive sublimate of mercury, and very similar to the smell and taste of the effluvia from the con-

fluent small-pox, just after maturation; and it constantly excited in me a salivation, during my attendance upon the sick in those places. I ascribed, in some measure, my security from the disease to this effect upon the salivary glands." During the pestilence of last summer and autumn, in this city, I remarked in myself, whenever placed in infectious situations, an incessant inclination to discharge saliva by spitting; but ascribed this, probably by mistake, to my caution in avoiding to swallow it while immersed in bad air. A constant attention to this point cannot be too strongly enjoined; and, in order to increase the quantity of saliva, as well as to insure its discharge by spitting, it is always advisable, in infected places, to keep some pungent aromatic substance in the mouth. Rinsing the mouth and throat as often as may be convenient, and especially after returning from suspicious situations, as well as before eating and drinking, will always be proper. Attention to frequent ablution, and to all the circumstances of personal cleanliness, will, probably, afford sufficient guard against the absorption of miasmata from the surface.

II. This indication is of great importance. Water, the universal diluent and solvent, deserves to be relied upon for this purpose to a great extent: it should be taken copiously and frequently: and all those articles of diet in which it is a predominant part should be considered in the same light. An addition of a small quantity of any sound fermented liquor, especially porter or cyder, to the degree of rendering it more palatable and gently stimulant, will occasionally be useful. Taking animal food in the form of soup, using milk plentifully, and moderately distending the stomach with any of those liquid preparations of farinaceous substances and fruits which are easily digested, will correspond to this indication. I can scarcely express the degree of relief which I often experienced, during the prevalence of the last pestilential epidemic in this city, by the large use of these diluting and nutritious articles: they speedily removed a distressing sense of heat at the stomach, which I could ascribe to nothing but the presence of the poison of pestilence. Two advantages arise from keeping the stomach moderately filled by these liquid substances: every thing acrid is diluted; and the absorbents, fully employed in taking up what is bland and agreeable, will be more likely to reject what is unsuitable.

It is remarkable, that of those persons who are attacked with yellow fever a great majority are seized in the night, or find themselves ill on awaking in the morning. According to Dr. Fordyce, the reverse of this, and by a very large majority, is true of the cases of ordinary fevers.\* Can this circumstance of yellow

\* Dissertation on Simple Fever, p. 33.

fever be owing, in any measure, to the emptiness of the stomach taking place in the night, and the closer access to its coat thereby afforded to the pestilential virus?—If this conjecture have any foundation, an oily diet must be very important as a preventive of yellow fever, and especially when taken at night, just before going to bed, as, for example, a supper of salad dressed with oil. A plentiful use of butter must also be advisable on the same principle. If our opinion be true, the same advantage would result from an oily diet in stomachic pestilence, or yellow fever, which has been said to arise from the application of oil to the surface of the body, in the glandular and carbuncular pestilence of Asia.

Mountebanks and jugglers, who undertake to swallow poisons in public, in order to astonish the multitude, and to draw money from vulgar credulity, are always careful to take these poisons on a full stomach.\*

In the advanced stages of yellow fever, milk is often resorted to as the only substance which can then be borne by the diseased stomach. But might it not be used habitually, and in large quantity, as a preventive, and also, in the early part of the disease, as a means of obviating future mischief? Wepfer found that milk, given to animals at the same time with some of the strongest vegetable poisons, greatly diminished their force.

But of all the means of obviating the approach of this disease, preserving regularity in the intestinal discharges is, perhaps, the most important. And, indeed, when this is completely done, it seems probable that nothing short of the most concentrated and virulent assault of miasmata will be sufficient to bring on the disease. It cannot be too deeply impressed, that the stimulus of pestilential poison, especially at the beginning of its operation, acts like an excessive dose of opium and many other stimulants, in arresting the intestinal discharge, and thereby precluding its own exit from the system.

III. But if all preventive means prove ineffectual, and symptoms of the disease be perceived to approach, it then becomes greatly interesting to do whatever may be expedient with the least possible delay. As yellow fever is here considered as the stomachic form of pestilence, produced by a poison primarily acting upon that organ, it is proper, in this case, as in other cases of poison received into the stomach, in the first place to attempt the expulsion of it. This can be best accomplished by an emetic, which, given at a proper time of the forming stage, is perfectly safe, and efficacious beyond all other remedies. The discredit attached to this remedy, in yellow fever, is owing to the postponement of it till inflammation, or some higher affection of the stomach, had come on, which

\* See Wepfer (Hist. Cicut. Aquat.)

could only be thereby aggravated, and rendered more speedily fatal.

If, therefore, during the prevalence of yellow fever, a person be affected with any disorder of the stomach, head-ach, or pains of the back or limbs, with chilliness or flushing of the face, and especially if such feelings shall have been preceded by an interruption of intestinal evacuation, whiteness of the tongue, &c. he will judge wisely to take an emetic\* without a moment's delay, and, as soon as the operation of that is completed, to procure a speedy and perfect unloading of the intestines. The choice of cathartics deserves attention. Such as operate expeditiously and powerfully will the sooner discharge the miasmata adhering to the intestines, and pent up by costiveness. Extraordinary virtues have been ascribed to castor oil, and probably with reason: its demulcent and enveloping, as well as cathartic power, must be important, by guarding the alimentary canal from the attack of a corrosive poison. Many of the neutral salts deserve great commendation. The tartrate of soda (Rochelle salt), the phosphate of soda, and the tartrate of pot-ash (soluble tartar), are well adapted to this purpose; and they must be especially invaluable whenever the infectious matter of pestilence is constituted with such a proportion of the principle of acidity as to become actually acid.† Injections may do much to procure a speedy solution of costiveness, particularly when they consist of so large a bulk of water, with a quan-

\* In the works of Frederick, the late king of Prussia (vol. ii. p. 229.), we find the following attestation of the efficacy of emetics.

"But the ravages of war were unequal to the ravages which epidemical disease made in the hospitals. The disease we speak of was a species of inflammatory fever, accompanied with all the symptoms of the plague. The sick became delirious on the day they were attacked. Carbuncles appeared on the neck, and under the arm-pits. Whether they were or were not bled, it was the same: death carried off all those, without distinction, who were attacked by this malady; the venom of which was so virulent, its progress so rapid, and its effects so prompt, that the patient, in three days, was in the grave. Resort was ineffectually had to every kind of remedy. At length emetics were employed, and succeeded.‡ Three grains were dissolved in a measure of water: the sick were made to drink till the dose began to operate; and this was found to be a sovereign specific against the disease: for after it was brought into use scarcely three out of a hundred died. The causes of the disease, no doubt, were perspiration, impeded by cold and indigestion, occasioned by bad food. Powerful evacuations only were found effectual."

† See Dr. Mitchill's paper on soda, Med. Repository, vol. ii. p. 297.

‡ *On eut recours à l'emetique.* By this phrase the royal author probably means some preparation of antimony. [Note of the English Transcriber.

[For a reference to this quotation, I am indebted to Mr. J. W. Watkins, of the Seneca Lake.]

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I



tity of mild oil and muriate of soda (common salt), as will effect a mechanical dilatation of the large intestines. For this purpose they should be administered by a large syringe, with some force, and in a continued stream, till the distension excite uneasiness. In some instances, the quantity has been carried to the extent of two gallons with advantage. In marshy countries it has been frequently observed, that remittent fevers and dysenteries often interchange their forms; one always suspending the other. In the West-Indies it has been proposed to use, by injection, a solution of the muriate of mercury (corrosive sublimate), in order to impregnate the system with that remedy. Might not a solution of this or some other active stimulant be injected into the rectum, in order to excite an artificial tenesmus and dysentery—a safer disease than yellow fever—for the purpose of diverting, by continuity of membrane, the morbid action from the stomach?

IV. The means of fulfilling this indication have already been so much the subject of discussion, that it will be less necessary now to dwell upon them. It is obvious that, when the disease assumes the tone of active inflammation, blood-letting will stand first on the list of remedies to be employed to diminish its violence. It is admitted, at the same time, that the use of this evacuation, especially in the more malignant and prostrating forms of the disease, will require the greatest caution and discernment. But, to deny altogether the admissibility of blood-letting in a state of such violent inflammation as the yellow fever often exhibits, and where dissection shews, in cases where it had been omitted, such extensive effusions of blood and serum in the lungs, brain, and other important viscera, is, in my judgment, to oppose some of the most established maxims in the practice of medicine. It is true, indeed, where a large dose of miasmata has been received into the system, and remains, for some time, undiluted and undiminished, that every hope of relief from this remedy will ultimately fail.

The efficacy of mercury deservedly places it high in the list of remedies adapted to this indication; but as the operation of it is very complex, and little understood, it would be improper, at present, to undertake the discussion.

Blisters are entitled to great confidence, especially when applied to the epigastric region for the purpose of relieving the local disease of the stomach; but they are generally resorted to at too late a period. They seem to be better adapted to obviate the incipient affection of the stomach, than to restore its exhausted powers, or to arrest the decomposition which takes place in the advanced stages.

Cold water, applied to the surface of the body by affusion or immersion, is one of the most powerful means of diminishing excessive action of the sanguiferous system in fevers. Dr. Currie,



of Liverpool, has treated this subject with so much ability and precision, that its importance in the scale of remedies is likely to be greatly augmented. He is very sanguine of its efficacy in yellow fever, and accordingly recommends it, in strong terms, to practitioners of medicine in the West-Indies and in America. In the more violent cases he prefers immersion to affusion, as being more competent to produce that great reduction of action which the exigency of the occasion requires; but in this mode of application, it is obvious, the remedy will demand the utmost attention. It is so impossible, in a few words, to do justice to his directions for the management of water, in its external and internal use, that the reader must be referred to the work itself for more complete information. As a means of carrying off heat, and of dissolving the catenation of morbid actions which forms the essence of fever, this remedy can have no superior.

The advanced stages of yellow fever, like those of other malignant diseases, often present a condition of the system not yet sufficiently investigated, and which it is a great desideratum to be able successfully to treat. This condition, besides the usual circumstances of debility and exhaustion, is distinguished by duskiness of the skin, often by livid or black maculæ, by a darker colour and thinner consistence of the blood, by tendency to hæmorrhagy, and by other signs of the scorbutic diathesis. How far the irritability of the system may immediately depend on the quantity of oxygenous matter present in it, or how far the stimulus of pestilential poison may be apt peculiarly to consume and dissipate such matter, I shall not, at present, undertake to inquire. But as this state of the body, in yellow fever, so remarkably resembles the appearances of scurvy, and as a large supply of oxygene is found to be so efficacious in the latter disease, it is surely proceeding on fair analogy to extend the remedies of scurvy to the state of the disease now in question. The efficacy of the native acids of vegetables, and particularly the citric, has been long established in the treatment of scurvy. Besides the usual modes of administering these acids, by conveying them into the stomach, perhaps some preparations of them might usefully be introduced by way of injection. And if to this be added the respiration of air, charged with an additional quantity of oxygenous gas, the force of this remedy will probably be carried to the utmost degree.

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## R E V I E W.

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**ART. I.** *Description of the Genesee Country, its rapidly progressive Population and Improvements; in a Series of Letters, from a Gentleman to his Friend.* Albany. Loring Andrews and Co. 1798. 4to. pp. 37. with a Frontispiece and two Maps.

**T**HERE are few things on which the mind dwells with more delight than a series of improvements directly conducive to the comfort and happiness of man. The cutting of roads, the constructing of bridges, the erecting of houses, the clearing of land; in short, the rendering a wilderness habitable to the human species, is, at once, a noble and transporting theme for contemplation. The little pamphlet before us affords a most agreeable picture of the settlement and progress in cultivation, population, and the useful arts, of the tract of country in the State of New-York called Genesee. This tract, which is "bounded on the north by Lake Ontario, on the west by Niagara River and Lake Erie, on the south by the State of Pennsylvania, and on the east by the counties of Tioga and Onondaga," is an example of as rapid growth, in respect to inhabitants and industrious exertions, as any, perhaps, within the United States.

If we are right in our conjecture concerning the author,\* there is good reason, from his opportunities of acquiring information, and from his candour, to entertain a favourable opinion of the statements and facts this work contains. The letters are five in number, and are written with plainness and perspicuity. Prefixed to them is an handsome perspective view of Fort Oswego, on the shore of Lake Ontario, in lat.  $43^{\circ} 28' 5''$  N. delineated by Mr. De Witt, the Surveyor-General of the State, and engraved by Mr. Fairman, an enterprising and promising young artist of Albany. Subjoined to the letters are a neat and instructive map of the counties of ONTARIO and STEUBEN, within the before-mentioned limits, and a map of the navigable waters of the Genesee, the Seneca, the Mohawk, the Hudson, the Susquehanna, and the Delaware, which connect this western part of New-York with Ontario and the other lakes, or inland seas, on the one side, and with the Atlantic Ocean on the other.

After this general account of the performance before us, we shall lay before our readers some extracts from it, to give a more

\* C. Williamson, Esq.

particular idea of the writer's subject and manner. The first is a description of the bay and village of Sodus, on the south side of Lake Ontario. (Page 14, &c.)

"The town of Sodus is, however, making considerable improvement: a set of mills are finished, and considerable other improvements are carrying on. This place is situated on a bay of the same name, which is well known as the best harbour on the south side of Lake Ontario. Few or none exceed it, even on the sea-coast, for spaciousness and beauty. The extent of the bay, from north to south, is about six or seven miles; and, from east to west, from two to four miles. It is not above a short half mile across the entrance: the grounds around the bay rise considerably high. When the lake is agitated with a storm, the bay may be passed safely in a canoe. Vessels may anchor near the town, in twenty-five fathom water, on a sandy bottom. In many places a vessel of fifty tons might lay afloat near enough the shore to land on a plank. In this bay there are several fine islands,\* covered with fine timber, which, with the head-lands stretching into the bay, afford a picturesque view from the town scarcely to be equalled. The town stands on a rising ground, on the west point of the bay, having the lake on the north, to appearance boundless as the ocean, and the bay to the east, romantically intersected with islands, and parts of the main land stretching into it. The first view of this place, after passing through a timbered country from Geneva (twenty-eight miles), strikes the eye of the beholder as one of the most magnificent landscapes human fancy can picture; and the beauty of the scene is not unfrequently heightened by the appearance of large vessels navigating the lake. At the sight of these immense bodies of water, the mind of a reflecting man must be struck with admiration at the situation of these western countries. With very trifling interruption to the navigation, they are boundless as the ocean. I was at Sodus some time ago, when a boat, with a number of families on board, put into the bay: they appeared to be French: being questioned as to their business, they said they were bound for the Spanish settlements on the Illinois River: some of them had been there the year before, and stated that, excepting the falls of Niagara, they had only a carrying-place of half a mile from lake Michigan to a branch of the Illinois River. They said they had still 1500 miles to sail. What an extensive inland navigation!

"You will find all the Genesee country abounding with situations both valuable to the farmer, and amusing to the gentleman and man of leisure: but, amongst all the variety it affords, they

\* \* Some of these islands contain fifty acres, all of very fine soil: they will produce vegetables in great proportion, particularly onions.

must all yield to Sodus for fishing, fowling, sailing, or hunting: it stands here unrivalled; and, perhaps, no place in America can equal it. Fish of various kinds, many of them from the ocean, can be had at pleasure; and a species of green turtle may be procured in great plenty, not inferior to the green turtle brought from the West-Indies. In the spring and fall all sorts of water-fowl are innumerable in the bay. In the adjacent woods are abundance of deer. They may be easily drove into the bay, and the chase is continued by water, greatly to the amusement of those fond of such sports. Strangers, going to Sodus, will find good accommodation in a house built for the purpose. There is kept there a handsome sail-boat, and every apparatus necessary to accommodate the sportsman in pursuit of his amusement.

"The lands about Sodus are a black, sandy loam, very deep; a soil not very common in this country, but of an excellent quality for every species of cultivation: it affords the finest garden in this country."\*

Another extract we make from p. 22, on the climate of Genesee, compared with that along the sea-coast.

"You will find that the climate of the Genesee country not only forms a very interesting part of its advantages, but also of its natural history; those parching heats that, on the south side of the Alleghany Mountains, seem to dry up every particle of nourishment from the plants, are never known in this country: in almost every instance a hot day is succeeded by a plentiful shower, which preserves, throughout the summer, a constant verdure: by these means our pastures and meadows are not to be excelled in the world. The nights are, in proportion, cool; and a traveller from the coast is surprized to find, in the dog days, a couple of blankets a comfortable covering. Late frosts in the spring, and early frosts in the fall, are uncommon, and almost in no instance has the fruit or corn suffered by them. The peach-trees, the great test of a climate free from severe and late spring frosts, come to great perfection. In one orchard, at an old Indian town near Geneva, the occupier of the farm sold to a neighbouring distillery, last year, 100 bushels of peaches.

"In the winters of 1796 and 1797, two gentlemen kept a regular diary of the weather; the one at Bath, in Steuben county, the other at Lancaster, in Pennsylvania: the result was, that, at Lancaster, the cold was greater than at Bath, from 11 to 13° during the winter; but the spring at Bath commences about ten days later. If more proof was necessary to establish this important fact, viz. the moderation of the climate, it might be stated, that

\* "It is very common to see onions, in the gardens at Sodus, from fourteen to fifteen inches in circumference."



the settlers have, in many parts of the country, been in the custom of turning into the woods part of their cattle before winter, at a distance from their farms; and, in the spring, they have, in every instance, been found in good order, and with less loss than might be expected from the same number of cattle if kept about the houses. The frosts have never been so severe as to stop the operation of the mills, with a very trifling precaution: so remarkable was this circumstance in 1797, that a number of sleighs came from Pennsylvania to the Bath mills—a distance of seventy miles. Except in shallow places, the lakes never freeze; and the navigation of the Seneca Lake has not been impeded since the settlement of the country: this will appear the more remarkable, when frequently, within that period, the North River has been frozen at New-York, the Delaware forty miles below Philadelphia, and the Chesapeak Bay as low as Annapolis: all this is owing to the relative situation of the Genesee country. The country is bounded on the north and west by great bodies of water, which do not freeze, and in this direction there is not one mountain. The northerly and westerly winds, which scourge the coast of America, by blowing over the Alleghany Mountains late in the spring and early in the fall, covered with snow, are tempered by passing over these waters: and these mountains, to the south of us, do, at the same time, prevent the destructive effects of the southerly breeze in winter, which, by suddenly thawing the frozen wheat fields, destroys thousands of bushels. While the lakes and Alleghany Mountains are in existence, so long will the inhabitants of the Genesee country be blessed with their present temperate climate."

We make one more extract from Letter iv.

"It has very erroneously been supposed, that the face of the Genesee country was a flat, level, rich country, full of swamps and stagnant waters; when, in fact, the direct contrary is the case. The whole tract of country from Geneva to the Genesee River, with very few exceptions, is composed of a range of gentle ridges of land, running most frequently from north to south; between each a run of water, and considerable bottom land on each side. This affords the best situations imaginable for farms, each partaking of a proportion of high land and meadow. The upland, as it is termed, is timbered chiefly with hickory, oak, and walnut, and the intervale with elm, basswood, sugar-tree, &c. The stone to be found on these ridges mostly inclines to lime-stone, which is a certain indication of lands of the best quality for grain of all kinds. The openings, or large tracts of land found frequently in this country free of all timber, and shewing great signs of being once in a state of cultivation, is a singular circumstance. This sort of land, from the ignorance of the first settlers of its quality,

was supposed to be barren, and little valued: necessity, at first, obliged some to attempt the cultivation of it, and they were most agreeably disappointed to find the crops excellent, and, in several instances, have continued to reap a crop every year, for these seven years. This sort of land, which, six years ago, would not have sold for a quarter of a dollar per acre, is now reckoned cheap at ten dollars.

"It is difficult to account for these openings, or the open flats on the Genesee River, where ten thousand acres may be found in one body, not even encumbered with a bush, but covered with grass of such height, that the largest bullocks, at thirty feet from the path, will be completely hid from the view. Through all this country there are not only signs of extensive cultivation having been made at some early period, but there are found the remains of old forts, where the ditches and gates are still visible: they appear to me, in general, to be well chosen for defence: from the circumstance of swords being found in them, with French inscriptions, it is concluded that they are of French origin. I do not recollect that the French had ever so great a force in this part of America at so early a period: for these forts, from very large decayed timbers lying in them, and large timber growing over, the others falling down, must be at least two hundred years old: the forts are, besides, too numerous for mere stations; and great collections of human bones are found in them, which shews they have been occupied for many years. An examination of this part of the country, by men of observation and science, might throw some light on the history of this part of America, now so little known."

We shall conclude with the following extract from the fifth Letter, p. 35, addressed to emigrants, especially from Europe, to whom the enthusiasm of the author holds out inducements of a tempting kind.

"An European who contemplates moving to America, has a vast field before him: The United States offer a variety of soil, climate, and people: it is difficult to select from these the situations most conformable to his opinions and habits. That country where the climate requires exertion and industry to procure the comforts of life, and whose geographical situation admits of the produce of the country being easily transported to market, certainly bids fairest for having an orderly and well regulated government. The certainty of reaping a moderate profit is the only security for industry. This is very far from being the case on the western waters (Ohio, &c.) There corn, the common food of the inhabitants, is sometimes five shillings per bushel, some-

times one shilling, and every thing else in proportion.\* Their distance from any large city is too far to drive fat cattle, and their climate too warm for the dairy, or to allow salting or barrelling beef, was salt to be procured. That country seems also to have a different interest from the Atlantic States. With the Genesee country these objections do not hold good: droves of fat cattle can, at any time, be sent to Philadelphia, New-York, Albany, or Baltimore. The distance is not greater than that of the best grazing countries in Massachusetts, where they have, for many years past, drove their fat cattle to the Philadelphia market. From the south part of the Genesee country cattle can, in the spring, be sent down the Susquehanna, either for the Philadelphia or Baltimore markets, as well as every other article of produce. The Onondaga salt-works being in the immediate vicinity of the Genesee country, afford salt at an easy rate for curing beef and pork, or for exportation: no country is better suited for the dairy. These are advantages to a new country which are incalculable, and afford the means of bringing thousands of acres into cultivation.

"For my own part, after having seen great part of the United States, and resided six years in the Genesee country, seen it a dreary wilderness, and seeing it now possess every comfort a man can desire, who divests himself of the foibles and follies of large cities, I must decidedly give this country the preference. With the climate of Devonshire, it is to this country as Yorkshire is to England: it is near enough to the large cities to draw a revenue from their markets, but too distant to be affected by their vices and follies. It is the only part of America calculated for the residence of gentlemen of easy fortunes I have seen. A little industry will make the roads excellent, in a country where, for sixty miles in any direction, you cannot find a mountain or a swamp, or any barren land, and thick population will give convenience and luxuries. Our vicinity with Maryland and Pennsylvania procures us the finest horses in America, and we have had the same advantage of a breed of cattle and sheep from New-England. The lakes and rivers supply us abundantly with fish, the woods with venison,† the maple-tree with sugar,‡ and our industry with excellent grain.

"\* Since the army has left the Western Territory all grain has fallen in price so as not to be worth the raising, excepting for the consumption of their families, while all European goods and salt are very dear. It will take the produce of one acre to buy a pair of breeches.

"† For three several years back five hundred deer have been killed in the neighbourhood of Bath annually.

"‡ A settlement of fifteen families, in No. 4, seventh range, made, this year, two tons of sugar from the maple-tree: some families made 500lb.

"The most convenient route for Europeans to come to this country will be to land at New-York: they will, with much ease, reach Albany by water, and from thence they can either hire waggon, or take navigation by the canals on the Mohawk River to Geneva: unless the water was in good order I would certainly prefer the land journey. A waggon, with two oxen and two horses, will go twenty miles per day with a load of 30cwt. The accommodation by the state road will be found very good, and, should any accident happen on the road, assistance can be procured at every stage. The great secret of moving with facility is to carry nothing but bedding, clothes, and cookery materials. Cabinet-makers from Scotland and London are to be found in several parts of the country: the soil producing excellent timber for furniture, which may be procured at every saw-mill, and converted into furniture for little more expence than the carriage of it would amount to from any distant part."

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ART. II. *Facts and Observations relative to the Nature and Origin of the Pestilential Fever which prevailed in this City (Philadelphia) in 1793, 1797, and 1798.* By the College of Physicians of Philadelphia. Dobson. 1798. pp. 52. 8vo.

NOTICE was taken, in our Review, vol. i. No. 4. p. 556. of a publication then made by this medical body, concerning the prevention of the introduction and spreading of contagious diseases. The pamphlet now under consideration is very much of the same kind as the former. It contains a summary account of the proceedings of the College relative to the plague with which Philadelphia has been several times visited: and a laboured effort to prove, *that this distemper was imported from the West-Indies, and propagated by contagion.* In this nobody can entertain a doubt of the purity of their motives.

We find, however, frequent mention made of *contagion*, but no account of its constitution and nature. Great attention to *cleanliness* is recommended, and no precise mode of effecting it pointed out; and *purification of bedding and clothing*, by exposing them to *carbonic, sulphureous, and nitric acid vapours*, is advised (p. 9.), without any proof that these destroy pestilential matter; and while, at the same time, it is certain that they diminish more or less, the wholesomeness of the atmosphere with which they are mingled.

The facts exhibited appear to have been collected with great industry, and are considerably numerous; but they establish not a single new proposition. They prove nothing but what has been

believed, upon similar evidence, before. The sum of the testimony, if we rightly comprehend, is this: *Wearing apparel, ships, and some parts of their contents, bedding, and some parts of camp equipage*, do sometimes become charged with matter containing the elements of pestilence; that pestilential matter is formed therefrom in the substances, whether tents, blankets, &c. which contain its crude ingredients; in that state it is brought occasionally into the port and city of Philadelphia, and there frequently sickens and kills the persons who are exposed to it. Such is the substance of the evidence. And this is true not only of Philadelphia, but of every other place where such nasty and abominable things are brought, provided such place be hot enough and wet enough to give them activity. But it must be remembered, that similar processes, and oftentimes upon a vast scale too, are going on upon the land likewise.

Yet, if seamen and passengers are nasty, and their ships *reek with inbred poison*, this is no proof of *importation from foreign cities*. If persons exposed to these venomous exhalations are poisoned thereby, even unto death, this is no proof of specific contagion. The yellow fever has appeared in New-York during the cold weather of the late winter, in consequence of exposure to the exhalations of beef, tainted last summer, sold out since at public auction, bought by dealers in damaged provisions, and kept in chambers where the poor families who consumed it dwelt. We have sufficient evidence that the like effluvia are frequently emitted on board of vessels, both at sea and in port. Must, now, these and other facts, of the most obvious and common occurrence, be all overlooked and thrown by, to make room for the misstated notion of imported contagion?

The College admits (p. 20.) that *pestilential fevers are generated in ships*, and in such circumstances (p. 21.) as are incidental to transports and garrisons. That learned and respectable body might surely also admit, that similar materials are worked up to equal virulence in certain parts of the American cities, as they are at present regulated; where the collected excrements, &c. of a century and more underlay and contaminate the whole earth on which they stand, and, by the heat of our summers and autumns, are sometimes turned to pestilence, and exhaled into the atmosphere to poison the inhabitants.



ART. III. *Medical Inquiries and Observations, &c.* Observations upon the Nature and Cure of the Hydrophobia. By Benjamin Rush, M. D. &c.

(Continued from p. 312.)

THE exertions of physicians to lessen the number of incurable diseases form a splendid part of the modern history of medicine. Success has not always crowned the endeavours directed towards this object; but no effort has been wholly lost; and the improvements made, in many instances, have been such as might be sufficient to incite even the most tardy in this career of usefulness.

The terrors of hydrophobia have long held possession of the minds of men. Few instances of the successful treatment of it are to be found upon record, and even these few are supposed by many to be of dubious authority. Our learned author, therefore, has not declined any difficulty in selecting the subject of these observations.

Dr. Rush assigns the following as some of the remote and exciting causes of hydrophobia: the bite of a rabid animal—cold night air—a wound in a tendinous part—putrid and impure animal food—worms, &c. And the theory of the disease which an examination of its causes, symptoms, and accidental cures, has led him to adopt, is, that it is a *malignant state of fever*. He is induced to think so from the febrile nature of the disease in all rabid animals—from its prevalence as an epizootic, at the same time that malignant fevers are epidemic—from the resemblance between the symptoms of canine madness and malignant fevers—and from the appearances of the bodies of dogs dead of the disease, as discovered by dissection.

Dr. Rush concludes, that the disease produced in the human body, by the bite of a rabid animal, is of the nature of a malignant fever—from its symptoms—from its appearing, like a malignant fever, at different intervals after the time of receiving the infection—from the similarity of the appearances of the blood when drawn in both cases—from the agreement of the diseases in point of duration—from the equally rapid putrefaction of bodies dead of either disease—and from the sameness of appearances in the dead bodies upon dissection.

The remedies for hydrophobia are divided by our author into two kinds: 1. Such as are proper to prevent the disease, after the infection of the rabid animal is received into the body. 2. Such as are proper to cure it when formed.—Under the former head of remedies, he mentions cutting or burning out the wound-

ed part—long and frequent affusion of water—and keeping the wound open and running for several months. He recommends low diet as a means of prevention, and supporting the spirits and confidence of the patient; but he does not rely upon mercury for this purpose, as the disease has been known to come on, notwithstanding a salivation.

As soon as the disease is discovered, Dr. Rush urges the use of blood-letting as the principal remedy, and advises that the quantity drawn be very copious. Many instances are adduced of the bold employment of this remedy with success. Besides blood-letting he recommends purges and clysters, sweating, and salivation by mercury. He also mentions cases where musk and opium, bark and wine, have been found efficacious remedies. Blisters and stimulating cataplasms, he supposes, may be useful in the decline of this disease, as they are in that of malignant fevers. The cold bath, also long immersion in cold water, have produced beneficial effects.

The analogy between hydrophobia and malignant fevers, which is so ably supported by Dr. Rush, in these observations, seems to be founded upon a just survey of the action of poisons upon the animal system. However various the substances called poisons may be, in respect either of their constitution or the effects they may occasionally produce, we are well persuaded they all hold many principles in common, and that a multitude of them attack animal life in a mode essentially the same.



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## MEDICAL & PHILOSOPHICAL NEWS.

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### DOMESTIC.

**A** LYING-IN WARD has been established in the Almshouse of the City of New-York. The cases which occur there are numerous enough to answer the purpose of public instruction. Accordingly, there is delivered a course of lectures on the obstetric art, including the anatomical, physiological, and practical parts, by *Valentine Seaman, M. D.* As this establishment is particularly and exclusively devoted to the education of *females*, it will be easy for *women* who practise, or intend to practise midwifery, to avail themselves of the excellent opportunities which are hereby held out to them.

*Extract of a Letter from Dr. Nooth, Superintendant-General of the Hospitals in British America, to Dr. Mitchell, dated Quebec, Jan.*

24, 1799.

"I can assure you I am almost convinced of the truth of your doctrine with regard to azote, or septon, as the cause of those epidemic diseases that generally make their appearance toward the end of summer in warm countries. There are some observations which I have made in my own practice, that lead me to suppose there may be *something of an acid nature*, that may act as an exciting cause, in the dysentery and yellow fever, and, indeed, in many other diseases that arise from heat and other circumstances, in the latter months of the warm season. Having unfortunately seen, in the course of my practice, a great number of dysenteric cases, and having experienced the inefficacy, in general, of the usual mode of practice, I was induced to try the effects of the several purgatives now in use, with the view of ascertaining how far any one was preferable to the others in the treatment of dysenteric patients. Experience soon taught me, that the *tartarum solubile* (neutralized tartrate of pot-ash) was the most salutary in its effects, and, of course, I have always, since that discovery, had recourse to it, in dysenteries and other autumnal diseases, and, I can assure you, with the greatest success, both in children and adults. The component parts of that neutral (acid of tartar and pot-ash), and the advantages attending its use in the above cases, seem to confirm your doctrine, and induce me to believe your theory is better founded than the world will, perhaps, at first, allow."

*Extract of a Letter from a learned Correspondent in Germany, to Dr. Mitchell, dated Sept. 15, 1798.*

"Our literature in Germany is much turned to politics: this causes the other sciences to be somewhat stationary. The KANTIAN philosophy is an exception, but I hope it will not last long. I confess that the author of this new scholastic system of metaphysical subtleties is a man of great genius and penetration, but his philosophy is quite unintelligible to those who cannot make a study of it their whole life; and his disciples, especially one FÜLTE, at Jena, are quite obscure. But KANT's sectaries say themselves, that to understand his fundamental propositions, one can only be 'enabled by guessing, and that to find the evidence thereof is only a case of accident, even for those who are endowed with the greatest philosophical genius.' Such are the words of one of those KANTIAN philosophers, who write the most plain—Mr. REINHOLD, Professor at Kiel. You cannot imagine what strange progress this philosophy (which demonstrates all *à priori*, and admits no knowledge of *à posteriori*, in philosophical matters) has made. All is infected thereby. We have theological and chemical treatises written in a jargon the most ridiculous: but it begins to abate. Mr. NICOLAI, a learned bookseller at Berlin, has written an excellent satirical novel, called GUNDIBERT, in which the principal hero is a KANTIAN PHILOSOPHER."

*Extract of a Letter from an eminent Character in Montpellier, to Dr. Mitchell, dated August 20, 1798.*

"I cannot forego the pleasure of writing to you from this place, after having seen all the physicians, and taken notice of the NATIONAL SCHOOL OF PHYSIC, or *l'Ecole de Santé*. All is well organized, and I am well pleased with the instruction. There are about six hundred students. The professors are

<i>Médecine légale.</i>	}	G. J. RENE, <i>Directeur</i> (Director.)
Medical Jurisprudence.		
<i>Physiologie et Anatomie.</i>	}	C. L. DUMAS.
Physiology and Anatomy.		
<i>Chimie.</i>	}	J. A. CHAPTAL.
Chemistry.		
<i>Matière Médicale et Botanique.</i>	}	A. GOUAN.
Materia Medica and Botany.		
<i>Pathologie.</i>	}	J. B. T. BAUMES.
Pathology.		
<i>Médecine opérante.</i>	}	A. L. MONTABRE.
Surgery.		
		V. BROUSSONET.

<i>Clinique interne.</i>	} H. FOUQUET.
Clinical Practice of Medicine.	} J. PETIOT.
<i>Clinique externe.</i>	} J. POUTINGON.
Clinical Practice of Surgery.	} A. MEJAN.
<i>Accouchemens, Maladies des Femmes,</i>	} J. SENEAX.
<i>Education Physique des Enfans.</i>	
Midwifery, Female Diseases, and	} J. M. J. VIGAROUX.
Management of Infants.	
<i>Démonstration des Drogues usuelles.</i>	} J. G. VIRENQUE, Con-
Demonstration of Drugs, &c. in	
common use.	servateur (Keeper.)

"I have made them acquainted with your Nomenclature, the state of learning in Columbia College, and convinced them that sciences are more cultivated in the United States than Europeans generally imagine. I particularly called their attention to your very interesting letter to Thomas Percival, of Manchester, concerning the use of alkaline remedies in fevers, and the analogy between septic acid and other poisons, inserted in the Medical Repository. It has been extremely acceptable to them in every respect, and especially on account of the justice you have done to a member of their old school, RIVERIUS, concerning the mixture of calomel and jalap, which is actually far from being a new composition, as is generally thought all over the United States. I intend to translate some of your works," &c.

Mr. HUMBOLD, who has distinguished himself by many new and surprizing experiments on GALVANISM, or metallic irritability, intends, as we are informed, to make a voyage to the West-Indies, and into the South-Sea, to prosecute his inquiries concerning animal nature, and the influence of climate and air on animal bodies, in those latitudes. He is an able chemist, mineralogist, and botanist, and has discovered many new *subterraneous plants* and *mosses* in the mines. He is a director of several mines in Franconia, and possesses such an universal genius, that much more may be expected from his researches.

CHRISTOPHER DANIEL EBELING, Professor of History and of the Greek language in the Gymnasium of Hamburg, has published the fourth volume, in the German tongue, of his Geography and History of America. The three former volumes contain his account of the northern and eastern states of our confederacy, and of New-York and New-Jersey. The present volume, which we have just received, contains upwards of nine hundred pages, and is employed entirely in a description of Pennsylvania. It is

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dedicated to **FREDERICK AUGUSTUS** and **HENRY MUHLENBERG**. It is remarkable with what industry and correctness this author collects and arranges the materials of the history and topography of a country which he never saw. We seriously recommend to our readers the forwarding of genuine and authentic information concerning the several States in the American union, to a man who will employ them so ably and usefully as **Mr. EBBELINO**. This work is a continuation of **BUSCHING's** *Erdbeschreibung*.

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*Concerning the new Sort of Manure found in the Town of Kent, in Litchfield County, Connecticut; communicated in a Letter from Mr. Thomas Whitten, to the Committee of the American Mineralogical Society, established in the City of New-York, dated Kent, August 16, 1798.*

"GENTLEMEN,

"I send you a specimen of mineral substance for examination. I discovered the mine whence it is obtained four years ago; and, by throwing some of it out, I found it made grass grow very largely; and, by trying it on *Indian corn*, found it to be better than plaister of Paris or ashes. Then I gave the farmers about forty tons, and they carried some of it to twenty miles distance, and tried it. They found it to be good for *cucumbers, carrots, beets, cabbages, potatoes*, and all sorts of *garden roots*. Last year I built a mill, with four pestles or pounders, and a run of stones, to pound and grind the ore for the people.

"It is the opinion of some, that we are coming to lead or silver, by the looks of the mine. It lays on the ridge of a hill, on my own land; and there are two streams of water, both running to the south, one on the east side, and the other on the west side of the hill. The mine runs north-east and south-west. I have opened each side of the hill at forty rods distance, and find it runs through, and small veins are to be seen at each stream.

"I have dug chiefly on the east side, where the ground has a considerable pitch, and have got the rock eight feet high. After descending three feet there is a parting in the rock, where the red ore layeth. I just begin to come where the water issues through the rock, and begin to get some pieces, as large as a cent, which look like lead, and will cut with a knife. Under foot is the same looking rock.

"The whole hill appears to be of the same kind as that which I have sent you.

"When the sun shines a day or two, there comes a *white substance* out of the rock, which so covers it all over, that I can

scrape it off by handfulls. I send you also a sample of this. I would thank you to send me a letter, &c.

"I am, Gentlemen,

"Your very humble servant,

"THOMAS WHITTEN."

A parcel of this *new manure* has likewise been received from Dr. Buel, of Sheffield, Massachusetts, and subjected to examination.

Since this substance is related to be so highly valuable for a manure, it was deemed worth the while to analyze it particularly and with care.

On being subjected to a variety of tests and experiments, the samples which have been received have been found to consist chiefly of a loose mixture of *carbone* and *iron* (plumbago, or carbure of iron), bedded in a *friable silicious rock*—and this combination of *coal* and *metal* appears to be its valuable and fertilizing part: for the *white substance*, described in Mr. Whitten's letter, is a mixture of the acid of sulphur with iron and clay, constituting *copperas* and *allum*. Those ingredients may, therefore, be deemed sterile, or, perhaps, noxious to vegetation. Whether the quantity of them is sufficient to make it profitable to extract them for economical purposes, the proprietor can best determine.

It is hoped a particular history of the effects of this manure will be given by some person who has it in his power to watch its operation, experimentally, on farms and in gardens.

Sir Joseph Banks, President of the Royal Society of London, has forwarded to Dr. Mitchill copies of two botanical works, edited by himself. The one is *Kæmpfer's Icones Selectæ Plantarum*, select figures of plants, collected in Japan, published from the originals in the British museum: the other is *Reliquiæ Houstounianæ*, or figures of the plants collected in South-America by William Houstoun; published from his own engravings, now in the library of Sir Joseph. It is much to be regretted, that men of large fortunes do not more frequently expend a part of their income in promoting useful inquiry, and enlarging the bounds of knowledge, as this munificent and enterprizing gentleman does.

In the year 1792, the Legislature of New-York appropriated the sum of £750 annually, for several years, for the endowment of additional professorships in Columbia College. This liberality was the theme of praise among all persons who heard it, in foreign parts as well as at home; and New-York was considered the patronizer of letters and of science. This allowance, however, from the treasury of the state, was, in reality, not a gratuitous of-

fering to that seminary, but a very inadequate and trifling compensation for the lands belonging to the college, lying in the counties of Cumberland and Gloucester, and ceded, without an equivalent, to the people of Vermont, by the commissioners appointed by law to treat with the citizens of that state. Had not the property of Columbia College been thus taken away, and sacrificed between contending claimants, there would have been no need of soliciting or receiving public bounty.—It was hoped by the public spirited citizens of the state, and by the friends of its literary and scientific reputation, that this grant of money, which is now about to expire, would have been continued at the last sessions, ending in April, 1799; but no such thing was enacted. On the contrary, although the regents of the university, in their annual report of March 5, 1799, subscribed by Mr. Jay, the Governor of the state, informed the legislature that “much good has resulted from this enlargement of the plan of academical instruction,” and that the *useful professorships*, supported by that fund, are in danger of entirely “falling to the ground, unless they continue to be sustained by the bounty of the legislature,” the continuance of the grant, even for a small number of years, was altogether withheld. This retrograde step in public spirit and improvement is worthy to be recorded and kept in remembrance. Such a refusal to aid the CAUSE OF EDUCATION, *by providing for the training up of youth in the liberal arts, sciences, and virtue*, deserves to be contrasted with the profusion with which the legislature have endowed a STATE PRISON, *for the accommodation of a set of wretches, many of whom have forfeited their right to live in society, and who are, by their crimes, rendered unfit to be any longer members of it, with boarding and lodging, and clothes, and food, and drink, for terms of years, or for life.* TWO HUNDRED THOUSAND DOLLARS have been appropriated to save rogues and convicts from the whipping-post and the gallows; while SEVEN HUNDRED AND FIFTY POUNDS are denied, to aid the instruction of our youth in *natural and moral things*. We feel much concern in laying these matters before our readers, who cannot fail to reflect on the disproportion of the means employed to form the minds of our youth, the hopes of the country, by every liberal incentive, to habits of rectitude; and the means adopted to restrain criminals, the despair of society, by locks and bars, from overturning the foundation of the laws.—We hope there will be no occasion of animadverting again upon the singular contrast.

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We understand that Dr. Priestley is shortly about to commit to the press, a work on the *Institutions of MOSES, compared with those of BRAMHA and the Eastern Asiatics*. A candid comparison of

the law of the HEBREWS with that of the HINDOOS, by such a hand, cannot fail to interest a large number of our learned and inquiring citizens.

A handsome impression of the anatomical appearance of the human body, after removing the common integuments, has been executed by Alexander Anderson, M. D. of New-York. A part of the abdominal and thoracic viscera are also represented. The engraving is about thirty-six inches by eighteen, and is done in wood, after the manner of Mr. Bewick. This promising young artist, who has repeatedly given proofs of his taste and skill, has sailed for Europe, to perfect himself in the art of engraving, under the best masters in London and Paris.

We have received from Mr. TILLOCH the several numbers of his *Philosophical Magazine*, published in London. The satisfaction with which we have perused this excellent work, can hardly be expressed stronger than by the copious extracts from it, inserted in the following article of this number of the *Medical Repository*. It gives an excellent view of the state and progress of philosophy, especially in the physical sciences.

## FOREIGN.

### *Magnetism.*

WENZEL has proved that cobalt is susceptible of magnetic attraction, and has magnetic poles. Klaproth has proved, that the purest nickel, that even of the *Chrisoprasus*, is also susceptible of the same attraction, and has magnetic poles. The serpentine of Humboldt has magnetic poles, but does not attract iron. The case is the same with several sorts of lava. Here, then, are bodies which have polarity, without attracting iron. Are there bodies which act upon iron without having polarity? Tralles, a geometrician of Berne, has taken very small fragments of Humboldt's serpentine, which had very perceptible poles, and, having placed them close to very strong magnets, the poles of which were opposite to those of the serpentine, the poles of the serpentine became inverted.

*Letter from his Prussian Majesty to the Academy of Sciences at Berlin.  
Read in the sitting of the 19th of April, 1798.*

After procuring the necessary information respecting the pre-

sent state of the Academy of Sciences at Berlin, it appears to me requisite to make some changes, calculated to ensure to that institution an existence equally honourable and useful for the public good.

I cannot conceal from the academy, that its labours, taken in the aggregate, have always appeared to me too little directed towards the public benefit. It has confined itself too much to the discussion of abstract subjects, and to enriching metaphysics with speculative theories and learned discoveries; and has not paid sufficient attention to direct its labours to objects of real utility, the improvement of the arts and sciences; a service by which the Academy of Paris, for example, notwithstanding its many defects and vicious organization, formerly distinguished itself. I could wish, then, that the Academy of Berlin would *humanize* itself more, if I may use the expression, than it has hitherto done, by giving encouragement to efforts that contribute to the happiness of common life, to the improvement of every thing that concerns its wants, and to its inconveniences, by the constant application of the theory of the sciences, to things rather than to speculative meditations; that it would excite the national industry, which so often makes attempts in new channels, without success, for want of the necessary knowledge, by furnishing it with the principles suited to that art which it exercises; that it would endeavour to purify the different systems of moral and literary education from many vague and erroneous principles, which fashion, and the imagination of some enthusiastic pedagogues, have introduced, and which must degrade future generations; and that it would combat the prejudices and delusions of the people, as well as the licentious and destructive efforts of the false philosophers of the present day.

It is by directing the labours of the different classes of the academy towards objects of this nature, and towards a multitude of others, the influence of which is equally salutary to the state and to its subjects, that this institution can acquire the most glorious titles to the gratitude of the public. The talents of its members authorize me to entertain great hopes, and seem to have need only of permanent impulse in a good internal direction. It belongs to the academy to call forth the principles of it from its own bosom. The following are a few general points, which serve as a basis for a new arrangement. The academy, after having maturely weighed them, will make the application of them in detail, and will draw up articles of regulation, which it will take care to lay before me to receive my approbation and signature.

The ancient regulations of the academy—above all, that of the year 1746—will be retained, and put in force, so far as they are not abrogated by the new.



I shall take care to appoint a president, distinguished by his rank and literary talents. His duty, above all, being to maintain the established order, to concentrate and direct the labours and talents of the different members towards objects useful to the public and honourable to the academy, to watch over the administration of its finances, and be its organ with my person, it will be necessary to fix the extent and limits of his functions by an express article.

The economical commission of the academy, which has hitherto subsisted, shall be abolished, and its place supplied by a directory.\* The members who composed the commission shall, however, be maintained in the enjoyment of their pensions.

The directory shall be formed of a president, the four directors† of the classes, and two members, to be chosen not from the academy, but men of business, equally distinguished by their literary merit, and capable of preserving the necessary order in the economical state of the academy. I propose, for filling these places, Suarz,‡ privy counsellor of justice, and Bogstede,§ privy counsellor of finances, who, at the same time, will be elected members of the academy.

Every thing which relates to the general direction of the academy as a body, to the maintenance of internal order, the management of its finances, and, above all, the direction of the academy towards objects of public utility, shall be the province of the directory. Its deliberations shall be decided by a plurality of votes. Each member shall have one, and the president two.

The influence and rights of the directors in their classes seem also to require to be more particularly defined and regulated; and the academy will take care to make provision on this head by an article in its regulations.

The members of the academy shall be either honorary or ordinary. The former, not being properly obliged to engage in its labours, cannot enjoy any of the lucrative advantages of the academy, except in regard to medals, in case they are present. The ordinary members shall be divided, as hitherto, into four classes.

Each class shall be composed of a director and six members, which will form a whole of twenty-four academicians, besides the members of the directory. It will be proper to adhere, in future, to that number, and not to admit new members but when there are vacancies. There can, therefore, be no new election,

\* The ex-minister, J. Ch. Wöllner, assisted at the sitting of March 29, as chief of the economic commission, for the last time.

† H. B. Merian, J. Bernoulli, F. K. Achard, and Ch. G. Selle.

‡ Died on the 14th May, 1798.

§ Installed in the sitting of May 3.

but when the members of each class are below six in number. As, at present, there are classes which have more, it may, perhaps, be possible to transfer some of them to the classes which have not the fixed number, or to those which have fewer supernumeraries, in order to establish a kind of equality between the classes, and, by these means, to approach as near as possible to the order to be observed in future. In the last place, the right of electing its members shall be preserved to the academy; and this election shall be determined by a plurality of voices of all the members: I, however, reserve to myself that of confirming or rejecting.

The large public library at Berlin, as well as the collection of natural curiosities, shall be united, in future, with the academy, and entrusted to its direction. It will be, therefore, necessary to determine, by a regulating article, the arrangements to be made in that respect; and as it will be requisite that the principal librarian be an academician, the academy will have the less hesitation to admit Dr. Biester\* among its members, as his knowledge and literary merit have already ensured him the suffrages of the public.

To conclude: though I am disposed to preserve to the academy the enjoyment and administration of its funds and revenues, I, however, reserve to myself the right of deciding more particularly on this subject, after the new state of its economy for next year shall have been presented to me for signature. In regard to that of the current year, which accompanied the letter of the 28th, it is herewith returned.

FREDERICK WILLIAM.

1798. Received April 11th.

*A singular Phenomenon in regard to Cream.*

The following singular phenomenon is announced in the *Journal de Physique*, Thermidor 6th, 1798, by Cit. de Serain, *officier de santé* at Saintes.—This summer I was witness to an extraordinary fact, to me totally new, and which, in my opinion, cannot easily be accounted for. One day, when some people in this neighbourhood were preparing to churn butter, they were astonished to find all the cream of a fine Prussian-blue colour. The caseous part was only blueish. Every attempt to discover the cause of this extraordinary colour was fruitless, though the cream exhibited the same appearance for nearly three months. It cannot be ascribed to the vessels in which the milk was generally preserved, as they were always kept perfectly clean, and covered with fir boards. The cows were in exceeding good health, and fed on meadows,

\* Installed in the sitting of April 26.

on which they had grazed for several years. This milk was used as food, without any hurt ensuing, and it betrayed no particular taste; but the cream and caseous parts were thrown away, as they inspired some dread. The cream gradually changed its colour; but this could not be ascribed to the means employed during the continuance of the phenomenon, means, indeed, so ridiculous that I do not think it worth while to detail them.

In the *Ephemerides of the Curious of Nature*, Dec. 2d, 1688, we find instances of milk being coloured green, black, red, and yellow; but I am acquainted with no observation similar to that above-mentioned.

#### Physiology.

Professor Weideman, at Brunswick, transmitted lately to the Royal Academy of Sciences, a paper on the more exquisite sensibility of certain parts of animals, from which the following is an extract in the author's own words:

"Many animals have a most exquisite sensibility at the tip of the muzzle, and particularly those which have these parts long. This delicate sensibility is principally produced by the end of the *nervus infraorbitalis*, in conjunction with some fibres of the optical nerves, especially the middle branches, which run across the *masseter* in an oblique direction. The *nervus infraorbitalis* is strongest in those animals which have long muzzles, or muzzles covered with long whiskers. The muzzles of animals are moved, in particular, by three delicate muscles: and, besides these, several folds of the cutaneous muscle lie at the side of the snout, and the branches of the optic nerves proceed, in particular, to these muscles. I, however, found, in a hedge-hog, some fibres of the optic nerves proceed to the root (*bulbus*) of a bristle. For the most part, however, these roots of the long whiskers are connected with the numerous and proportionably strong branches of the *nervus infraorbitalis*, which proceed to them in the form of a bundle, and, in general, transmit two fibres to the root of each bristle, which they embrace on both sides. This appearance I found exceedingly pretty in the head of a hare newly killed. In animals not provided with these whiskers, the nerve proceeds only to the glandulous skin of the nose, and which may be very distinctly observed in swine. The whiskers serve as the vehicle of a finer sensation, in order to forewarn animals, in certain circumstances, of the near approach of danger; for the slightest touching of the summits of these bristles excites in them a very strong sensation. Cats, and other animals which hunt for their prey in the night-time, extend the skin of the whiskers, which enables them to ascertain the nature, and even the hardness or softness of the bodies which they approach."

Cit. Langles, a member of the *French National Institute*, has already contested with the Europeans the invention of the compass, of paper, and of printing, in order to assign them to the Orientals. In a new memoir on gunpowder, he deprives the German monk, Berthold Schwartz, of the fatal honour of that terrible invention, and asserts, that it was conveyed to us from the Arabs. He assures us, that they made use of it, in 690, at the siege of Mecca; and he adds, that the Arabs derived it from the Indians, among whom it was known in the remotest antiquity, since their sacred books (the Vedam) forbid the use of it in war. Cit. Langles is of opinion, that a knowledge of these different inventions might have come to us from the east, on the return of the crusaders. There is an interval, however, of two centuries, between the last crusade and the first typographical attempts of Guttemberg, in the city of Strasbourg, about the year 1440. Gunpowder was known earlier in Europe than printing; but it does not appear that it was employed there in war before the battle of Creci, where the English had six pieces of cannon. If the conjectures of Citizen Langles are well founded, the Europeans, at present, only carry back to the east, knowledge which we formerly borrowed from that quarter. Thus every thing changes on the face of the globe: the arts are lost in one nation to be revived in another; nations themselves are effaced and disappear; and vast accumulations of water covered formerly those countries which we inhabit at present. All this proves, that the small globe upon which we reside is very old; and that to live a century or two is nothing. We have scarcely time to commence our studies.

Cit. Langles read also a memoir on the Arabian literature.

An abstract of a paper (read at a former meeting) entitled *Experiments to determine the Density of the Earth*, by Henry Cavendish, Esq. F. R. S. and A. S. has been read to a meeting of the Royal Society of London. These experiments, which are extremely ingenious and interesting, are detailed at full length in Part II. of the Transactions for the present year. They were projected by the late Rev. John Michell, F. R. S. but he did not live to carry them into effect. After his death the apparatus came to the Rev. F. J. H. Wollaston, Jacksonian Professor at Cambridge, who transferred them to Mr. Cavendish. The apparatus contrived for making sensible the attraction of small quantities of matter, and which has been improved by Mr. C. is very simple: it consists of a wooden arm six feet long, suspended by the middle, in an horizontal position, by a slender wire forty inches long; to each extremity is hung a leaden ball about two inches in diameter; and the whole is inclosed in a wooden case, to defend it from the wind.

As no more force is required to turn this balance on its centre, than is necessary to twist the slender suspending wire, the smallest degree of attraction of a leaden weight or weights, a few (eight) inches in diameter, brought near to the small suspended ball or balls of the balance, will be sufficient to move it sensibly aside.

To determine from hence the density of the earth, all that is necessary is to ascertain what force is required to draw the arm aside through a given space, and then to have recourse to calculation.

To prevent any disturbance from currents that might be produced within the box that contained the balance, by even the difference of temperature that might be occasioned by heat being communicated, by the bodies of the experimenters, to one side of it more than another, it was supported in the middle of a close room: the operators, from adjoining apartments, viewed the operation through holes in the wall, by means of telescopes; and the apparatus had a strong light thrown upon its two ends (an opening being left at each end of the box for the purpose), by means of two lamps, also in the adjoining apartments, the rays from which were likewise made to pass through holes formed in the wall.

The two large balls were suspended from a beam near the ceiling, which could be moved in an horizontal direction, by means of a string and pulley, so as to be brought near to the small balls of the balance, or made to recede again, without requiring any person to be in the room.

From this description it will be easily seen, that, on the two large balls being brought near to the two small ones, but on opposite sides of each, that their forces may not counteract each other, the small suspending wire of the balance must be twisted by the movements of the arms, occasioned by attraction, which carries the small towards the large balls; and that the wire, endeavouring to untwist itself, will again, in its turn, carry the small balls away from the large ones. Vibrations are thus occasioned, which would continue a long time before the small balls would settle between the first point of rest and the large balls: but it is not necessary to wait for this; an ivory scale at each end of the balance enables the experimenters, by means of their telescopes, to see the two extreme divisions to which the small balls move in their vibrations, and thus to determine the middle point. The time necessary for each vibration is also noticed.

It would be impossible, in a short notice, to do justice to Mr. Cavendish's ingenious experiments, and the calculations founded on them. Those who feel themselves interested in them will have recourse to the original account. We shall only mention the result. By a mean of the experiments, the density of the earth comes out 5.48 times greater than that of water.



By the experiments made by Dr. Maskelyne, on the attraction of the hill Schéhallien, the density of the earth was computed to be only  $4\frac{1}{2}$  times that of water.

A paper\* by Mr. Home was also read, containing an account of some experiments, made in order to ascertain the cause of the light seen in the eyes of cats and some other animals in the dark. After enumerating the opinions of other philosophers, he proceeds to shew, that when the light was perfectly excluded from the room in which the cat was placed, the eyes were never observed to shine; whence he concludes that the eye merely collects the light diffused through the room. He then relates some observations on the structure of the optic nerve. Having dissected the eye of a cat just killed, he was surprized at finding the retina *transparent*. This induced him to repeat the experiment, not only on cats, but also on horses, and always with the same result, if the retina was examined immediately after death. But if this examination was delayed an hour or two, it was opaque and whitish, as described by anatomists. The optic nerve, from the retina to the brain, seemed to be composed of bundles of fibres not parallel to each other, but alternately interwoven and separated, the interstices filled with a transparent fluid, so that a transverse section, taken near the brain, was nearly a circle, containing about forty opaque round spots; near the eye about two hundred of these spots, and in the middle about a mean between these numbers. These observations were made with a microscope magnifying about twenty-three times.

At their second meeting, on the 15th, a paper by the Rev. Mr. Vince, on an unusual atmospherical refraction, was read.—One day last summer, directing his telescope to the sea, he observed part of the mast of a cutter (the hull being below the horizon), and above it an inverted image of the cutter, above which appeared a direct image of the same: these two images were joined at their hulls; but the point of the mast of the inverted image appeared to be as far above the top of the real mast as this last was above the horizon. These images appeared and disappeared very suddenly, something like the beams of the aurora borealis, beginning a little above the real object, and darting upwards.—The learned author, after supposing these appearances to be occasioned by atmospherical strata of different densities, recommends it to philosophers to investigate this subject; and suggests the utility of stationing men, provided with telescopes, at certain places on the coast; as, by this means, he thinks, vessels and other objects might be sometimes discovered long before they would otherwise become visible.

\* The Croonian Lecture.

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## APPENDIX.

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### DOMESTIC.

#### ARTICLE I.

*Application of the Doctrine of Septic Fluids to explain some of the Diseases of Human Teeth and Bones. From a Letter of Mr. MITCHILL to THOMAS CHARLES HOPE, M. D. &c. adjunct Professor of Chemistry in the University of Edinburgh. Dated Schenectady, Oct. 10, 1796.*

IT gives me great satisfaction to learn, from your letter of September 5th, dated at Edinburgh, "that you very much agree with me in the views I have adopted respecting the generation of the various combinations of oxygene and septon;"—that you feel interested in the progress I may make in the inquiry, and have pleasure in collecting and communicating any thing relative to it that may occur.—As you suggested, the pamphlet in which the experiments made to destroy contagion in the British and Russian ships, by means of the vapours emitted from salt-petre, had reached me before the receipt of your letter; and I had attempted to shew in what manner "the facts might be entirely reconciled with the opinion" which, as you politely observe, "so many concurrent circumstances have led me to adopt." I rejoice that these experiments have been made, and by public authority, upon so large a scale. I hope they will be repeated until complete satisfaction shall be obtained of their true nature and value. From summing up the whole evidence in the most impartial manner I am able, I am induced to believe the greatest part of the benefit derived from them arose from ventilation, purification, removal of nuisances, and the better medicinal and dietetic management of the sick; and the rest of the good experienced proceeded from the *vital air* extricated from the nitre. The *nitrous gas* appears to have been so far from doing any good, that I am confident the result would have been more clear and decisive without it. I should, therefore, propose, as an amendment of the project, to perform all that was performed on those occasions, excepting the *septic gas*, and improve the respirability of the air in the apartments, by supplies of *oxygenous gas* alone.

Since the date of my last, I have had no reason to retract any part of the doctrine then advanced; but, on the contrary, there has been such an influx of new matter, that I have found a necessity of enlarging and extending it in all directions. For want of something better, I now take the liberty of presenting you with the application of it, to explain some of the morbid changes which the *teeth* and *bones* of animals undergo in the progress of life. It seems to me we are far enough advanced in knowledge, to attempt something like a scientific explanation of some of the alterations which bones suffer by disease: and this explanation will be the more seasonable, as the writers on surgery have scarcely undertaken any thing of the sort. What I have aimed at, in this respect, is, to connect the facts related by the late Mr. Hunter, of London, with those detailed by Mr. Russel, of Edinburgh, by means of certain experiments and observations of my own.

From the known disposition of oxygene to combine with septon, and form the septic acid, it appeared to me probable, that it would be formed occasionally in the human mouth, from the remains of food adhering to the teeth, sticking between them, and corrupting there. If this was the case, this acid ought to unite with the calcareous earth of the teeth, and form the septite of lime, which might be washed away by the spittle, or, possibly, in some instances, concrete upon the teeth themselves; and, if formed there, the acid might be expected to corrode the enamel, lay bare the bony part, and bring on a caries; or to incrust the outside, irritate the gums, and occasion soreness and bleedings.

In order to determine whether these things were so, I procured, from a dentist, a quantity of the substance called "the tartar of the teeth," which I supposed might contain some septite of lime, and subjected it to a number of experiments.

Having, some time before, received complaints from the merchants of Glasgow, of the faulty quality of the pot-ash and pearl-ash, supplied from the port of New-York, and having been requested, by the President of the Chamber of Commerce, to visit, with him, the stores of the inspectors of those articles in the city of New-York, I had collected samples of pot-ash and pearl-ash, of the first qualities, with the view of making some experiments upon them.

These salts, being in their caustic state, had been placed in separate glasses, to attract water and carbonic acid from the atmosphere; and, after standing several months, the ferruginous and earthy parts having subsided, beautiful crystals of the alkali were formed at the bottom of the liquor.

A solution of these crystals was made in water that had been boiled some time, to extricate its air, and precipitate some of its

earth; and to this solution of pot-ash was added a parcel of the yellowish earthy matter scraped from human teeth, which had been previously reduced to powder in a mortar.

Instantly on mixing them, bubbles of air were set loose, and thickly floated on the surface of the mixture; and by their long continuance without bursting, seemed to indicate a sort of tenacity in the fluid, derived, probably, from animal mucilage.

The coarser part of the earthy matter soon sunk to the bottom, but the finer particles took a long time to settle down; yet, in a few minutes, even before the liquor had become clear, a piece of clean paper, dipped in the solution, and dried before the fire, deflagrated on being burned, and emitted numerous flashes and sparkles, after the manner of salt-petre; while no such lucid or radiant appearance was evident on setting fire to paper that had been dried after dipping in a solution of the alkali alone.

It is not unworthy of remark, that the smell of the mixture was offensive and nauseous, resembling, as much as any thing, the nasty odour of ditch and puddle water. On repeating the experiment several times, and in the presence of several persons, the above-mentioned appearances were, with trifling variations, similar.

The object of inquiry having been less to make an entire analysis of the lapis dentalis, or "tartar of the teeth," than to ascertain whether it contained any *septic* acid, I shall content myself, for the present, with the persuasion, that the question is determined in the affirmative, *by the union of the septic acid of the tartar* (which would seem to consist partly of nitrite of lime, combined with animal mucus, &c.) *with the alkali of the mixture into nitre, which deflagrated on being subjected to the operation of fire with the paper to which it had attached itself.*

In order to apply this principle, it must be understood what the component parts of the teeth are. SCHEELÉ and GAHN seem, as long ago as 1776, to have succeeded in obtaining *phosphoric* acid from the bones of animals, by employing *septous* (nitrous) acid, which dissolved their lime, and constituted with it *calcareous* nitre, while the *phosphoric* acid was set free. More recently, BERNIARD (*Journal de Physique*, Octobre, 1781.) obtained *phosphoric* acid not only from fossil bones, from those of the whale and sea-horse, but from the tooth of the manati, and the grinder of the elephant. It has also been extracted from ivory.

In short, they who have experimentally attended to this subject have agreed, that animal *bones* are chiefly composed of *phosphoric* acid and *calcareous* earth, or are *phosphats* of lime; and that their *teeth* consist, in the main, of the like materials. *Septic* acid, therefore, formed in the mouth, decomposes teeth upon the same principle that, in the experiments of the Swedish chemists, it dis-

organized bone; that is, by detaching the phosphoric acid from the lime, and combining itself with that earthy basis.

HUNTER (Natural History of Human Teeth, p. 125.) has an idea that the concretions on the teeth resemble the intestinal balls and bezoars found in the bowels of many animals—and this opinion is probably very just; but, perhaps, less just is his other idea, that these extraneous matters consist merely of "earth and the common secreted mucus." (Diseases of the Teeth, p. 66.) He informs, that he has seen such earthy depositions "cover not only the whole tooth, but a part of the gums: in this case there is always an accumulation of a very *putrid* matter, and frequently a considerable tenderness and ulceration of the gums, &c."

The destruction of the enamel and bony part of the tooth, the rottenness of the alveolar processes, the ulceration, absorption, and bleedings of the gums, and the fetid breath, seem to arise occasionally from the same general cause.

To understand the reason of these things, it will be necessary to examine what is the order of chemical elective attraction between phosphoric acid, one of the constituent parts of the teeth, and other bones, on the one hand—and between lime, the other ingredient, and the substances with which it has a disposition to combine, on the other. And in doing this, there will be little or no danger of encroaching upon the vital œconomy or animated structure of these parts, because the *enamel* "has no marks of being vascular, and having a circulation of fluids." (Natural History, &c. p. 35.) And there are great doubts whether even the *bony* parts possess either blood-vessels or absorbents. (Ibid. p. 39.)

Phosphoric acid prefers lime to alkalis, and, therefore, alkalis united with it are immediately rendered turbid by lime-water; and a saline powder, very difficultly soluble in water, is deposited, consisting of lime saturated with phosphoric acid. Alkalis, therefore, whether fixed or volatile, would seem to be incapable of destroying the solid matter of the teeth, whatever their action may be upon the gums. Lime may be disengaged from its connection with phosphoric acid by the oxalic, sulphuric, septic (nitric), and tartaric acids. Consequently, acid of sugar, spirit of vitriol, aquafortis, and cream of tartar, may decompose the teeth by attracting the lime, and disengaging the phosphoric acid. The septic acid, after barytes, pot-ash, and soda, has the next strongest attraction for lime, and after this, for magnesia, ammoniac, and clay.

Septic acid thus, if formed from the remains of animal and vegetable substances, lurking about or among the teeth, in attaching itself to the lime, will detach the acid of phosphorus. This, added to the matters already emitting their scents, will have a tendency to increase the offensiveness of the breath.



Whatever contributes to the accumulation of the matters from which septic acid is produced, may be expected to injure the teeth. Hence lying-in women, and persons suffering long fits of sickness, are particularly exposed to the causes which destroy them; and this the more rapidly, because, in such situations, it often happens, that little or no assistance is afforded by art, in removing those things which, by their presence and accumulation, occasion the mischief. When formed in the mouth, it may mingle likewise with the spittle, and vitiate the *gustatory powers of the tongue and palate*, and, when swallowed, may impede the healthy *functions of the stomach*. Hence may be explained one species of anorexia, especially that mentioned by DARWIN (2 Zoonomia, class II. ord. 2. gen. 2. sp. 1.), where "want of appetite is sometimes produced by the putrid matter from many decaying teeth, being perpetually mixed with the saliva, and thence affecting the organ of taste, and greatly injuring the digestion."—The formation of such a substance in the mouth enters deeply into the explanation of the symptoms of fevers, particularly the condition of the teeth, gums, tongue, and throat; with vitiated taste, thirst, apthæ, colour of the tongue, &c.

If an incrustation containing septic matter is thus formed, and is a calcareous composition, of a kind different from the teeth, it is possible to remove it by chemical agents, which have not the power of decomposing the teeth. For, as barytes, pot-ash, and soda, can take the *septic acid* away from the lime, either of these substances may be serviceable in removing the concretion, and, at the same time, not endangering the teeth, whose *phosphoric acid* having a greater attraction for lime than for alkalies, is incapable of being displaced by them. Alkaline dentifrices would, therefore, appear capable of removing the calcareo-septic incrustations from the teeth, but incapable of corroding the teeth themselves. DEBOZE observes, that tobacco ashes (*La Pratique de Medecine de Láz. Riviere, &c. L. vi. ch. 2.*) possess a surprizing (*tres-merveilleuse*) power to cleanse and whiten the teeth. The active ingredient must be the pot-ash. The practice of some ladies of New-York confirms this.

As the septite of lime, however, is very deliquescent, there is, perhaps, only a moderate portion of the septic acid contained in the stony tartar of the teeth. There is another form in which it is peculiarly destructive. Dentists distinguish tartar into three species, to wit, the *yellow*, the *black*, and the *green*. Of these, the last is observed to be, by a great difference, the most pernicious. It never forms a crust or petrification, but always appears like a *green stain*. The enamel of the teeth beneath it is generally corroded, and almost always eaten through or destroyed. This is, doubtless, owing to the *septic acid* formed under the edge of the

gum, or between the teeth, from the remains of food containing septon, which, aided by the heat and moisture of the mouth, affords that poisonous and destructive fluid, by uniting with oxygen. I have no hesitation to believe, that a small portion of this acid, formed thus in the mouth, and adhering to a sound tooth, is the cause of that violent, and sometimes fatal disease, consequent upon transplanting these bony substances into the bleeding jaws of another person. The cases are seldom or never venereal.

But the septic acid formed in these instances, by corruption on the surface of a tooth, poisons the patient of the dentist, when inserted into the fresh socket, in the same manner that it poisons dissectors, when their wounded fingers receive it from the surface of a putrefying muscle.

The safe method of preparing teeth for transplanting, is to wash them repeatedly, *before* extraction, with a weak solution of carbonate of pot-ash, in water, to remove the septic acid and other foul matters. This is, doubtless, preferable to washing the tooth in alkaline ley, *after* it has been drawn, as thereby its capability to grow fast would be endangered.

The septic acid being thus capable of corroding the teeth and the alveolar processes of the jaws, who shall affirm that its operation stops there? Is it not taken in with our air, food, and drink? Are there not instances of nodes and excrescences of bones, that are not wholly unlike the incrustations of the teeth? And are there not likewise instances of caries of the osseous parts, which have a near similitude to the rottenness of the instruments employed in chewing our food? These questions have almost been answered by the poets; and I hope there will be no impropriety, on this occasion, in referring to a poem or two.

VIRGIL (3 Georgic. 478.), in his account of the diseases of cattle, mentions the corrupted state of *air* and *water*. The vitiated qualities of the *atmosphere* and of *water*, are ascribed, by OVID (Metamorp. Lib. vii. 437.), to pestilential venom, in the fine description of the plague of Athens, which he makes ÆACUS give to CEPHALUS. The mention of this poet brings to my remembrance his story of the terrible monster PYTHON (Ibid. i. 438.), engendered from the putrid slime or mud of the Nile, and slain by APOLLO, the god of day. The mythologists generally agree that this is a beautiful physical allegory. The term "Python" is derived from the verb *putrefactum*, to putrefy or corrupt; and the truth intended to be inculcated is, that pestilential vapours, the offspring of corruption, cease to rise and contaminate the air, after the sun's rays have dried the land. The rays or shafts of light, then, darted to earth, destroyed Python, that is, exhaled the moisture, and put a stop to putrefaction and its destructive consequences.

The Greeks, who borrowed much of their knowledge from Egypt, interpreted *literally* some of these philosophical allegories. Hence the epithet "*Pythios*" was given to Apollo by some of his worshippers; and under this title the inhabitants of Megara erected a temple to his honour. (PLUTARCH in Vit. Anton.) His priestesses, even at Delphos, were called *Pythias*. And further to perpetuate this benevolent action, the *Pythian* games were instituted, wherein the victors were crowned with garlands of beechen leaves. This author's legend also of the voyage of the god *ÆSCULAPIUS* to Rome (Metam. xv. 622.), in the form of a serpent, with the committee of Roman citizens sent by the senate, during the rage of the plague in Italy, between the 458th and 462d years of the city, to fetch him from Epidaurus (3 Rollin's R. H. 305.), appears to be nothing more than another allegory, or popular story, expressive of the method taken by the Roman government, to procure, from the better informed Greeks, all the information they could, about preventing and stopping pestilential distempers. As *Æsculapius* was reputed the son of the Deity, to whom a surname was given from the monster or serpent he was alledged to have killed on the banks of the Nile, it is probable, when the figurative meaning of the allegory was dropped, the literal interpretation of "*Pythius*" was transferred from father to son, and thus a snake came to be the type or emblem of *Physic*. Some pleasant remarks have been made on this subject by Sir SAMUEL GARTH. (Works, p. 153.) I wish some *APOLLO* or *ÆSCULAPIUS* would destroy the *PYTHON* of the United States!

From the same root, whence *Python* is derived, probably come *πῦρ*, fire, and *πῶς*, corruption; expressive of the decomposition of natural substances by *combustion* and *putrefaction*. It must have occurred to mankind, very soon after they began to make observations, that when vegetable and animal bodies lost their living energy, or died, they soon underwent an alteration, and laid aside their old, and took upon themselves a new form; and that such of them as were not changed by the operation of *fire*, would yield, sooner or later, to the agency of *corruption*. They must soon have discovered, not only that these were the *two* great destroyers, but that there was a considerable resemblance in their manner of accomplishing their respective works; and that decaying bodies, which frequently evolved, during their decay, a great quantity of heat, were, in such cases, under the influence of both *πῦρ* and *πῶς* at once. Hence, in constructing their language, the Greeks, in this instance, as in abundance of others, most correctly kept up an analogy in words, corresponding to what they observed in fact.

As long as they confined these terms to express certain changes incidental to *inanimate* objects, the ideas suggested by this me-

thodical language preserved their correctness. But, in ancient times as well as in modern, there has been a constant disposition to transfer the terms appropriated to processes or modifications of dead substances, to express the conditions and functions of life. This is a source of much inaccuracy in speech and ambiguity in science. For example, the noun πυρ, which signifies fire, is sometimes employed, by HIPPOCRATES, to express a disease in which *violent heat* was a leading symptom. From this sprung πυρλος, a word often used by the old physicians, and also by the four evangelists (even by LUKE, ch. iv. 38. who, as Dr. FREIND observes, wrote the best medical Greek of them all), to signify a disorder in which *much heat* was accumulated. Thence, likewise, came πυρεξ, which appears to have been a more technical or professional term, meaning a distemper in which a *fiery heat* prevailed. The colonies of Greeks who settled in Latium, called afterwards Latins, adopted different modes of expressing these ideas: for that form of sickness wherein "fire" was supposed to predominate, was called by names derived from "fervor" and "flamma," which come from Greek radicals signifying *to be boiling or burning hot*; and hence the latinisms *fever* and *inflammation*, which are so common at this day in our own tongue: and where "putrefaction" was judged to prevail, they expressed the forms of it by putreo, putrefacio, putresco, putridus, &c. all derived from πύω, or πύωμαι; whence come the hellenism "*putrid*," and its kindred words.

Such is the origin of a set of terms which are too firmly established for any authority on earth to alter, notwithstanding they incessantly suggest false ideas to the mind. They have, from the time of their adoption to express any thing resulting from animation, perpetually bewildered those who employed them as mediums of thinking and reasoning on the causes of these kinds of diseases; which have, accordingly, been pronounced to be either *inflammatory* or *putrid*, or of a *mixed sort*; as if the body of a living animal, in which neither combustion nor putrefaction can take place, was subjected to the same accidents which disorganize a corpse! To complete the joke, as diseases accompanied with *great heat* were called by a name synonymous with *fire*, so, where the heat was *small*, they were expressed by a word signifying *smoke*; and such is the typhus (τυφός fumus) of the present day! From the difficulty of making revolutions, or even reformations, this pernicious effect of words upon ideas, and of language on opinion, will probably last for ages to come.—But to return from this philological digression: the absorption of the like pestilential (septic) matter has been asserted by LUCRETIVS (De Rerum Natura, Lib. 6.)

Hæc igitur subito clades nova, pestiliferaque,  
 Aut in aquas cadit, aut fruges perdidit in ipsas,  
 Aut alios hominum pastus pecudumque cibatus,  
 Aut etiam suspensa manet vis aëre in ipso;  
 Et cum spiranteis mistas hinc ducimus auras  
*Illa quoque in corpus pariter forbere nosse'st.*  
 Consimili ratione venit bubus quoque sæpe  
 Pestilitas, etiam pecubus balantibus ægor.

Sudden this novel plague, from doleful haunts,  
 Impregns the floods, infixes in the plants,  
 Infects the food which men and cattle share,  
 Or floats promiscuous, mix'd with common air:  
 Hence, when the breast its vital gases drew,  
 The lungs absorbed the *septic venom* too,  
 Which not on man alone its force employ'd,  
 But lowing herds and bleating flocks destroy'd.

Who does not see, that from such or a similar venom might have arisen the symptoms of the BEAUTIFUL YOUTH whose case is described by FRACASTORIUS? (Syphylid. Lib. i.)

Paulatim ver id nitidum, flos ille juventæ  
 Disperit, vis illa animi: tum squallida tabes,  
 Artus (horrendum!) miseros obduxit, et alte  
*Grandia turgabant fædis abscessibus ossa:*  
 Ulcera (proh divum pietatem!) informia pulchros  
 Pascebant oculos, et diæ lucis amorem,  
*Pascebantque acri corrosas vulnere nares.*

By slow degrees the envenomed pest o'erpowers  
 His spring of life, and blasts its promis'd flowers,  
 Invades his joints, extorts distressful groans,  
*While deep imposthumes rot his knobbed bones:*  
 Oh righteous heaven!—of eyes but late so gay  
 Two frightful ulcers eat the balls away,  
 Whose acrid juice, corroding as it flows,  
*Deforms his look, and undermines his nose!*

And who, on reading this, can fail to recollect the description given by LUCAN (Pharsalia, Lib. ix.) of the miserable condition of SABELLUS, after being bitten in the leg by the Lybian serpent SEPS.

——— Miseri in crure Sabelli  
 Seps stetit exiguus, fixo quem dente tenacem  
 Avolsit que manu, piloque adfixit arenis.  
 Parva modo serpens, &c. &c.

V. 263.

Parva loquor corpus sanie stillasse perustum:  
 Hoc et flamma potest, sed quis regis abstulit ossa?  
 Hoc quoque discedunt, putresque secuta medullas  
 Nulla manere sinunt rapidi vestigia fati.

V. 733.



Wretched Sabellus by a *Styx* was stung;  
 Fix'd to his leg with deadly teeth it hung:  
 Sudden the soldier shook it from the wound,  
 Transfix'd and nail'd it to the barren ground.  
 Of all the dire destructive serpent race  
 None have so much of death, though none are less.

— Dissolv'd, the whole in liquid poison ran,  
 And to a nauseous puddle shrank the man.

— Nor ends the wonder here: though flames are known  
*To waste the flesh, yet still they spare the bone:*  
*Here none were left; no least remains were seen;*  
 No marks to shew that once the man had been.

Rowe.

But this opinion is countenanced by better evidence than the poets. For, in addition to the diseases of the teeth and their sockets, from septic acid produced in the mouth, as already stated, and partly upon the interpretation of the facts of Mr. HUNTER, it would be very easy to quote many authorities in the books. Instead, however, of displaying much reading, I shall content myself with referring to the authority of an intelligent and skilful surgeon, Mr. RUSSEL, who published, in 1794, a practical essay on that disease of the bones which is termed *necrosis*, wherein a bone or part of a bone dies, and a new one is reproduced to supply its place, or serve as a substitute. The *lower jaw-bone* is frequently disordered in this manner (p. 87.)—its death and separation often arise from *disease in the teeth and gums*, which, from their situation, naturally determine the complaint to begin at the upper part, and to proceed downwards (p. 80.)—and cases of *necrosis* of the lower jaw may be traced to the effects of blows, and of *tooth-ach*, especially if a violent attack of inflammation has been excited by the application of any *acid substance* to a carious tooth, &c. (p. 98.)—and seldom happen to persons under thirty years of age (p. 93.)

It would seem, therefore, that the reasoning would be fair and safe, to consider this caries of the maxillary bone as of a nature quite similar to the decomposition of the teeth and disordered condition of their sockets, which has been shewn to be connected with the formation of septic acid in the mouth, and its corroding effect there.

The factor of the breath has an analogy, in such cases, with the offensiveness of matter discharged from diseased bone, which, in general, is discoloured, and not thick; owing to a separation of the phosphoric acid of the bone from its calcareous base, which is now combined with septic acid, and running away with the other fluids, in the form of a thin and sanious discharge; or occasionally bringing on, when absorbed, that form of quotidian

intermitting fever, called the *hectic*, as in other cases of abscess and ulcer.

RUSSEL considers necrosis, whether happening in the tibia, femur, lower jaw, clavicle, humerus, fibula, radius, or ulna, as the same kind of disease (p. 86.) If, then, his classification of morbid affections is correct, and my application of principle to explain the phenomena is accurate, it will be proved, that the same septic poison which destroys the teeth corrupts the jaw; and from the same cause which disorganizes the jaw proceeds the decay of the rest of the bones; and this same agent which works the destruction of the rest of the bones is the irritating matter that kindles up hectic fever.

I would not wish to be understood as affirming that *all* caries of the teeth, jaws, and bones, arise from this sole cause. Far from it. The amount of my reasoning is simply this; that, from the most accurate survey I have been able to take of the subject, there does appear to be, in *some instances*, a decomposition of bone, by means of septic acid, absorbed from without, or formed, by union of septon with oxygene, within the constitution; and when this acid, mingled with other animal fluids, is carried into the blood-vessels, and exerts its noxious powers upon the heart, brain, and lungs, it may be the cause of febrile inquietude.

How far this principle may extend, if properly applied, I know not. I suspect that *syphilitic*, *cancerous*, and *scrophulous* ulcerations will be found to have a near alliance, as to their cause, with caries of teeth and necrosis of bone now under consideration. But time, with further observation and experiment, is necessary to refute or verify this conjecture. Be the result as it may, I think, as the game is started, and the track is fresh and warm, it would betray less than a sportsman's spirit to be discouraged on account of the doublings and windings of the chace, and give out before the object of pursuit is hunted down, or day-light let in upon its dark abode.

But I must quit the subject, and prepare to take my departure from this town, in which, notwithstanding the engagement of my mind upon what is here, you observe I can devote a few minutes to a correspondent in Europe.

To have an idea of the state of things at this place, picture in your mind a settlement, the third in size in the State of New-York, situated in a level spot, beside the river Mohawk, and not far above its greatest cataract; fancy to yourself the chief impediments to navigation removed, and the river covered with boats, loaded with families migrating westward, to the unsettled lands, or with the fruits of agricultural industry coming to market; imagine the goers and comers of gay people and valetudinarians along this thorough-fare, to the acidulous and medicinal springs

of Ball's-Town: and the employment of the sons of letters and of arts belonging to the respectable seminary of learning lately established here, in attending to such branches of knowledge as boys are usually taught in colleges: but do not imagine these things and others of a beautiful—Farewell—and remember I expect from you, as one of the friends and companions of my earlier days, all the help you can afford me in this inquiry.

Yours, with much esteem;

SAMUEL L. MITCHILL.

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## ARTICLE II.

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*To the SENATE and HOUSE of REPRESENTATIVES of the UNITED STATES, in Congress assembled.*

**T**HE Memorial of the subscribers, inhabitants of the city of New-York, for themselves and in behalf of their fellow-citizens, respectfully sheweth:

That, during the voyages made to and from the port of New-York, it often happens that the foulness proceeding from the crews and passengers, as well as from sundry articles of provisions and merchandize, on board their ships and vessels, turns to pestilence, and destroys the lives of many of the youngest and stoutest seamen in the merchant service.

That, from the repeated and long continued application of the impurities so produced and confined on ship-board, the timber of their vessels becomes impregnated with mischievous matter, insinuating itself into the pores of all the wooden work beneath the decks, and issuing forth occasionally in poisonous steams.

That such ships and vessels, themselves frequently old and offensive, loaded with corrupting substances yet more offensive, enter the port of New-York from foreign parts, and, unless stopped in their progress, straightway cast anchor in the vicinity of the city, and presently haul in beside the wharves.

And your Memorialists further state, that the lives of a number of their fellow-citizens on shore appear to have been destroyed by going on board such foul vessels, as well as by exposure to the exhalations from rotting substances taken from their holds, and carted through and stored within the city.

That the laws passed by the State Legislature have hitherto been found inadequate to the purposes of entire prevention of such ar-

rival and unloading, for want of a wharf, stores, and inclosed piece of land, at some convenient distance from the city, where sick persons might be taken out, foul cargoes landed, under the inspection of a revenue-officer, and the vessels cleansed by the agents of the Health-office.

That the regulation of commerce belonging exclusively to the National Legislature, this great and terrible evil of filth and sickness, thus introduced, cannot be sufficiently guarded against, unless the authority of the General Government should cause a piece of land to be purchased, and a wharf and stores to be erected thereon, somewhere between the city of New-York and the Narrows, to be under the direction of the Collector of the port.

Your Memorialists therefore pray, that such arrangements may be made, as in your wisdom may seem proper, to provide against this source of pestilence, engendered on board our ships, by erecting a suitable establishment on the east side of Staten-Island, or on any more convenient place, at the expence of the United States, and under the controul of the Custom-house, where sick persons may be taken care of, unhealthy cargoes hoisted out and overhauled, and infected vessels thoroughly purified.

SAMUEL L. MITCHILL,  
JOHN OOTHOUT,  
JACOB ABRAMSE,  
RICHARD BAYLEY,  
GULIAN VERPLANCK,  
CORNELIUS RAY,  
MOSES ROGERS,  
JOHN B. COLES,  
GABRIEL FURMAN,  
WILLIAM BAYARD.

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### ARTICLE III.

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#### *An Act respecting Quarantines and Health Laws.*

SECT. 1. **B**E it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the quarantines and other restraints, which shall be required and established by the health laws of any State, or pursuant thereto, respecting any vessels arriving in, or bound to, any port or district thereof, whether from any foreign port or place, or from another district of the United States, shall be duly observed by

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the Collectors, and all other officers of the revenue of the United States, appointed and employed for the several collection districts of such State respectively, and by the masters and crews of the several revenue cutters, and by the military officers who shall command in any fort or station upon the sea coast; and all such officers of the United States shall be, and they hereby are, authorized and required faithfully to aid in the execution of such quarantines and health laws, according to their respective powers and precincts, and as they shall be directed, from time to time, by the Secretary of the Treasury of the United States. And the said Secretary shall be, and he is hereby authorized, when a conformity to such quarantines and health laws shall require it, and in respect to vessels which shall be subject thereto, to prolong the terms limited for the entry of the same, and the report or entry of their cargoes, and to vary or dispense with any other regulations applicable to such reports or entries. *Provided*, that nothing herein shall enable any State to collect a duty of tonnage or impost, without the consent of the Congress of the United States thereto. *And provided*, that no part of the cargo of any vessel shall, in any case, be taken out, or unladen therefrom, otherwise than as by law is allowed, or according to the regulations hereinafter established.

Sect. 2. *And be it further enacted*, That when, by the health laws of any State, or by the regulations which shall be made pursuant thereto, any vessel arriving within a collection district of such State, shall be prohibited from coming to the port of entry or delivery by law established for such district; and it shall be required or permitted by such health laws, that the cargo of such vessel shall or may be unladen at some other place within or near to such district, the Collector authorized therein, after due report to him of the whole of such cargo, may grant his special warrant or permit for the unlading and discharge thereof, under the care of the Surveyor, or of one or more inspectors, at some other place where such health laws shall permit, and upon the conditions and restrictions which shall be directed by the Secretary of the Treasury, or which such Collector may, for the time, reasonably judge expedient for the security of the public revenue. *Provided*, that in every such case, all the articles of the cargo so to be unladen shall be deposited, at the risk of the parties concerned therein, in such public, or other ware-houses or inclosures, as the Collector shall designate; there to remain under the joint custody of such Collector, and of the owner or owners, or master, or other person having charge of such vessel, until the same shall be entirely unladen or discharged; and until the goods, wares or merchandize which shall be so deposited, may be safely removed, without contravening such health laws; and when such removal may be allowed, the Collector having charge of such



goods, wares or merchandize, may grant permits to the respective owners or consignees, their factors or agents, to receive all goods, wares or merchandize which shall be entered, and whereof the duties accruing shall be paid or secured, according to law, upon the payment, by them, of a reasonable rate<sup>s</sup> of storage; which shall be fixed by the Secretary of the Treasury, for all public warehouses and inclosures.

SECT. 3. *And be it further enacted,* That there shall be purchased or erected, under the orders of the President of the United States, suitable ware-houses, with wharves and inclosures, where goods and merchandize may be unladen, and deposited, from any vessel which shall be subject to a quarantine, or other restraint, pursuant to the health laws of any State as aforesaid, at such convenient place or places therein as the safety of the public revenue, and the observance of such health laws may require.

SECT. 4. *And be it further enacted,* That when, by the prevalence of any contagious or epidemical disease, in or near the place by law established as the port of entry for any collection district, it shall become dangerous or inconvenient for the Collector and the other officers of the revenue employed therein, to continue the discharge of their respective offices at such port, the Secretary, or, in his absence, the Comptroller of the Treasury of the United States, may direct and authorize the removal of the Collector, and the other officers employed in his department, from such port to any other more convenient place within, or as near as may be to such collection district, where such Collector and officers may exercise the same authorities, and shall be liable to the same duties, according to existing circumstances, as in such lawful port or district; and of such removal public notice shall be given as soon as may be.

SECT. 5. *And be it further enacted,* That it shall be lawful for the judge of any district court of the United States, within whose district any contagious or epidemical disease shall at any time prevail, so as, in his opinion, to endanger the life or lives of any person or persons confined in the prison of such district, in pursuance of any law of the United States, to direct the marshal to cause the person or persons confined as aforesaid, to be removed to the next adjacent prison where such disease does not prevail; there to be confined, until he, she, or they, may safely be removed back to the place of their first confinement; which removals shall be at the expence of the United States.

SECT. 6. *And be it further enacted,* That, in case of the prevalence of a contagious or epidemical disease at the seat of government, it shall be lawful for the President of the United States to permit and direct the removal of any or all the public offices to

such other place or places as, in his discretion, shall be deemed most safe and convenient for conducting the public business.

Sect. 7. *And be it further enacted*, That when, in the opinion of the chief justice, or in case of his death or inability, of the senior associate justice of the Supreme Court of the United States, a contagious sickness shall render it hazardous to hold the next stated session of the said court at the seat of government, it shall be lawful for the chief or such associate justice, to issue his order to the marshal of the district within which the Supreme Court is, by law, to be holden, directing him to adjourn the said session of the said court to such other place within the same, or an adjoining district, as he may deem convenient; and the said marshal shall thereupon adjourn the said court, by making publication thereof in one or more public papers, printed at the place by law appointed for holding the same, from the time he shall receive such order, until the time by law prescribed for commencing the said session. And the district judges shall, respectively, under the same circumstances, have the same power, by the same means, to direct adjournments of the district and circuit courts within their several districts, to some convenient place within the same, respectively.

Sect. 8. *And be it further enacted*, That the act, entitled, "An act relative to quarantine," passed in the first session of the fourth Congress of the United States, shall be, and the same is hereby repealed.

JONATHAN DAYTON,

*Speaker of the House of Representatives,*

THOMAS JEFFERSON,

*Vice-President of the United States, and President of the Senate.*

Approved, February 25, 1799,

JOHN ADAMS,

*President of the United States.*

Deposited among the rolls in the office of the Department of State,

TIMOTHY PICKERING,

*Secretary of State.*

#### ARTICLE IV.

*Of the EPIDEMIC lately prevalent in Boston.* By ISAAC RAND.

THE state of the atmosphere in the month of May was warm and pleasant. FAHRENHEIT's thermometer ranged from 48 to 82 degrees, at 2 o'clock, P. M. Twelve days the mercury

stood from 60 to 82. Nineteen days from 48 to 90, with alternate rain and sunshine. Some few persons laboured under rheumatism: some with asthma; and few had the typhus mitior this month.

June was pleasantly warm, with the winds for 17 days from S. and S. W. three days S. E. and E. four days the wind blew from the N. E. when the weather was cool and cloudy with rain. The remaining six days W. and N. It thundered with small showers the 3d and 29th. Thermometer ranged from 56 to 83, only one day 56. Twenty days, from 70 to 83. Nine days, from 65 to 70. Fevers, with inflammatory symptoms, pleurisy, bilious and inflammatory fevers, ophthalmy, and few cynanche parotidea.

July was hot and sultry. The S. and S. W. winds prevailed 18 days. Small showers with thunder 8th and 29th. The range of the thermometer was from 72 to 96, excepting three days it descended to 67. The typhus gravior, and in some instances the yellow fever.

August, the S. S. E. and S. W. winds prevailed 23 days. The remainder it varied from W. and N. W. to E. and N. E. It rained the 5th with thunder, 10th thunder, 12th small showers, 21st cloudy with thunder, 26th rain. Thermometer ranged from 72 to 94, the 20th and 23d, 67 and 69, healthy except the contagious fever.

September, light breezes from the S. W. S. and S. E. prevailed 22 days. Very little rain this month; part of this month hot and sultry. Thermometer ranged from 56 to 77. The night of the 29th a frost. The fever the latter end of this month abated.

October, the W. and N. W. winds blew 13 days: variable from N. E. to S. E. the remainder of the month. The 7th a great storm with much rain; a severe frost 29th, which arrested the further progress of the contagious fever. Thermometer from 30 to 56.

The epidemic, pestilential, or yellow fever, that prevailed in the town of Boston, in the summer and fall of 1798, appeared June 17, in a family which resided on Stoddard's wharf, consisting of eight persons; five had the fever, one died the 23d, another the 30th of the same month. Three recovered.

This wharf is situated between the Mill creek and Town dock. The dock is the receptacle of a large sewer, in which the cloacinae of the county jail and the neighbouring houses discharge their contents; and is surrounded by warehouses, which contained a great number of raw hides from the West Indies, and the Cape de Verd Islands; and a large quantity of beef not sufficiently salted. The juices from the fresh beef and pork which were packed in the contiguous stores flowed into this dock. Besides, being in the vicinity of Faneuil Hall market, all the putrid meat and decayed vegetables

were thrown into it; and all the filth of Court-street, Cornhill, Hanover-street, Wing's-lane, Union-street, and Dock-square, flows into it. It is also surrounded with fishmonger's stalls; the offal of the fish, putrid fish, oysters and clams were thrown there.

Some few days previous to their seizure with the fever, a quantity of damaged salt and pickled fish was thrown into the creek at the back of Stoddard's house, which produced a very putrid exhalation.

Soon after its appearance on Stoddard's wharf, a few persons who resided near, or transacted business on the wharves inclosing Green's and Spear's docks, in the vicinity of the Town dock, were seized with the fever, and it spread among some persons who did business in the lower part of State-street and the Long-wharf.

The disease, the latter end of July, appeared at the foot and declivity of the south-east and south sides of Fort-hill, and made a fatal progress; scarce any family that resided below the summit on these sides of the hill escaped the fever. One family lost five persons out of six; and probably the greatest part of the inhabitants of that part of the town would have fallen victims to the disease, had not their fears impelled them to remove. I know of but one family that escaped the fever, that resided there the summer and fall. The husband did business from home, and the wife was far advanced in pregnancy. It was observed that pregnant women escaped the fever, although some nursed their husbands while sick with it, and others were exposed to the contagious atmosphere, through the whole season, but escaped the infection.

The hill is a solid mass of clay from its summit to its base, at the margin of the river, and is covered with but a few inches of mould. Its declivity, towards the south, renders the rays of the meridian sun perpendicular, and proportionably increases its heat.

The S. E. S. and S. W. winds prevailed most of the months of July, August, and September, which wafted the exhalations from the wharves, stores, and docks at the foot of the hill upon the inhabitants that resided on those sides of it.

This side of the hill has been built upon but a few years; the families, from their first residence, had thrown their waste water, impregnated with animal and vegetable substances, at their doors: and as the declivity of the surface soon made it disappear, they had no drains to convey it to the river. The clay prevented its penetrating further than the termination of the mould; so that the extreme heat of the meridian sun, and the increased heat of the last summer, exhaled a gas that might otherwise have lain dormant, and conspired with other causes to render the air of that part of the town peculiarly disposed to excite this fever. At the margin of the river, on the S. E. and S. sides of the hill, there was stored

a large quantity of salt fish, many half putrid raw hides from the West-Indies, and many barrels of beef. The first person who was attacked with the fever on Fort-Hill, was a man who had been employed in conveying some of the putrid salt fish from the stores into the channel of the river. Another man who had purchased semi-putrid hides, soon after removing them, was seized with the fever, and fell a victim to his temerity.

When the S. and S. W. winds prevailed, the contagious effluvia were conveyed round the hill into Battery March, Liberty Square, and Kilby-street. Their deleterious effects were increased by the exhalations from the very foul docks encompassing Liberty-Square, into which some putrid, unsalted fish had been thrown, and extended their baneful effects into the middle part of State-street.

The latter part of August, all September, and part of October, the fever raged at the north part of town, in Front-street, a narrow confined dirty street, fronting the E. and S. E. of the harbour, and exposed to the exhalations brought by the E. and S. E. winds, from the extensive flats, and extremely foul docks, from Hancock's wharf to the Town dock. It affected some persons in Cross-street, at the corner of which it first appeared, where a cellar, which had not been cleaned for some years, was so offensive, that a number of hogsheads of lime were strewed over it before any person could be induced to remove the dirt from it into the street, where it lay more than a week; during which time, the occupier of the house was seized with the fever, but being removed, recovered. A poor family, consisting of four persons, whose circumstances would not admit of its removal, was seized with the fever, and all died; two women living in the opposite corner probably received the infection from the same source, and died.

The last of September, and beginning of October, the wind shifted to W. and W. N. W. which conveyed the noxious exhalations from the Mill Pond into Back-street; where the fever seized a whole family, whose garden-wall was washed by the waters of the pond; and individuals of some other families were also attacked with it.

The inhabitants contiguous to the pond, and others, throw dead dogs, cats, putrid meat, fish, and rotten vegetables into it; and drown many small animals there: the filth of the streets flow into it in every direction, and it is the receiver of the vaults surrounding the pond.

The intense heat of the sun, acting on these substances, and the mud of the pond, generated a most destructive exhalation, which, during the prevalence of the S. E. S. and S. W. winds, were blown from the town; but as soon as the wind changed to the W. and N. W. their effects were fatally experienced by some families in Back-street.



The Mill Pond was often drained of its waters, so as to leave the mud with the putrid substances exposed to the action of the sun.

When the fever appeared in Back-street, the Selectmen were requested to order the water to be constantly retained in the pond; which being enforced, the fever soon ceased in that quarter.

The cloacinae of the town were extremely offensive during the summer. Human ordure that has lain a long time in vaults, partly exposed to the sun, and undergoing a decomposition, emits a gas or exhalation highly destructive to human life.

The effluvia arising, while emptying a vault, that had been exposed to the action of the sun, produced the fever in Mr. Gordon, which proved fatal to him.

From information of some of the most intelligent merchants, there remained in the stores in this town, during the last summer and fall, an immense quantity of salt and pickled fish, part of them in a putrid state; and a great many barrels of beef semi-putrid, and exhaling a highly destructive vapor. These provisions were designed for the European and West-India markets; but, from the depredations committed on our commerce by the French, were not exported, and remained sources of poverty, sickness and death to many of our citizens.

The beef that is packed in Connecticut, and some other places, and sent to this market for sale, is put up in the fall and winter, with not one half the salt that is necessary to preserve it through the summer season; and when it is sold by the commission merchant, it is repacked; and not till then is the full proportion of salt added. Much of this beef was never disposed of, and was spoiled.

Three lads, apprentices to Mr. Marston the cooper, by repacking some of this beef, were seized with the fever, and all died.

The fish that is imported from Nova-Scotia and Newfoundland, I am informed, is cured with one third less salt than is used in the United States; and is more disposed to the putrefactive process in most hot seasons than the fish that is cured in these States.

The fever did not seem to be contagious from the deceased. I know of no instance of its being communicated to the nurses or attendants of the sick, in places where the disease was not originally contracted. But it appeared to be propagated by an impure local atmosphere, operating upon habits previously disposed to receive the infection.

Five persons, who were attacked with this fever in this town, were carried into the country. The fever, by the exercises and agitation, was increased, and proved fatal to all of them. No person received the infection from them.

Many of those, who were conveyed by water, after their seizure,

to Hospital-Island, in the lower harbour, recovered. None of the attendants sickened.

The atmosphere at the bottom of Cross-street, Fore-street, or Fish-street, the Town Dock, and on the S. E. and S. sides of Fort-hill, was so fully impregnated with contagion, as to be very perceptible to the smell and taste, exciting the same sensation in my mouth as a weak solution of corrosive sublimate of mercury, and very similar to the smell and taste of the effluvia from the confluent small-pox, just after maturation; and it constantly excited in me a salivation during my attendance upon the sick in those places. I ascribed, in some measure, my security from the disease to this effect upon the salivary glands.

Eleven persons, who were my patients, died, out of one hundred and three who were so very sick as to be confined to their beds with the fever: one of these was so suddenly seized as to die before any medicine operated upon him. I saw him but once before he died.

The Rev. Dr. LATHROP has favoured me with a letter from JEDEDIAH HUNTINGTON, Esq. of New-London, dated Dec. 10, 1798, respecting the epidemic fever which prevailed there the summer and fall of 1798.

“DEAR SIR,

“Since I wrote to you, I have examined a parcel of cod-fish to which much of our epidemic has been attributed. It had been spread several days before I saw it, so that it appeared in better condition than it otherwise would have done: Then, however, it was so rotten, as nearly to have lost the texture and taste of fish. I am told, that when it was in a pile, a yellow juice oozed from it, like to well-digested pus. There were other parcels of damaged fish in the vicinity, in the whole 120 quintals, part of which was cured, if the expression may be allowed, with less salt by one quarter than is generally used. Within a kind of parallelogram, formed by these parcels of fish, the fever originated, and within the same space, and the distance of an hundred yards from it, in several directions, it mostly prevailed.

“Some time previous to the first death, which was the 19th of August, at Bingham’s Coffee-House, and which was followed by three other deaths in the same house, several gentlemen remarked, that there was, in that neighbourhood, an offensive smell in the air, although the ground there is, in the nature of it, and from long experience, proved to be very healthy, being elevated and dry, and open to the land and sea breezes. Besides these parcels of fish, which had given particular offence, there were other noxious matters which may be deserving a place in the account. The vault of a temple of Cloacina, belonging to the Coffee-House

before mentioned, mostly above ground, was, for some time previous to the sickness, nearly or quite full, and was inclosed with stone, which was not so tight as to prevent the liquid part from issuing at the joints. A few days after the first death, a parcel of damaged clams were thrown out of the Coffee-House on the head of a wharf contiguous, which yielded such an intolerable stench, that persons in a house close by were obliged to quit their places. How long the clams had been in the house in that state I do not learn. Another filthy substance on the ground in question was a heap, composed chiefly of the dung of cattle, with the sweepings of the decks of vessels, and which might occasionally become the receptacle of a dead cat or rat, or other putrescent matter.

"There is another circumstance which relates to the subject, and that is a scarcity of water in very dry weather. The trouble of procuring a supply probably induced several families to make long intervals between their washings of clothes, floors, &c. All these last mentioned matters combined might not have been powerful enough to produce any contagion; yet, in co-operation with the fish (if that article could produce it, as our best informed citizens and physicians are confidently of opinion), they, doubtless, aided in a more inveterate infection; and still it is probable that the effluvium of the fish, with all its auxiliaries, might, in common seasons, have been harmless.

"The general state of the weather here and at Boston, the last season, was, I apprehend, much the same. Ours was uncommonly hot and dry, the mercury being from 95 to 97° for several days in succession. The total of the deaths by the fever is 83; say one tenth or twelfth part of the inhabitants remaining in town."

The coincidence of opinion, in this judicious, well written letter, respecting the origin and cause of their fever and ours, is very striking, and tends to confirm the observations in the preceding narrative.

This fever attacked the patient most commonly with a violent pain in the head; a severe pain in the back and loins; pains and soreness in the muscles of the thighs and legs; a violent pungent heat, and burning sensation, and pain at the præcordia; sometimes with difficult respiration, seldom with rigors, often with violent heat over the whole surface of the body; a nausea and vomiting, moist tongue, besmeared with a whitish mucus. Some had most exquisite pains in the stomach and bowels, with frequent vomiting of fluid blood mixed with bile. The nausea and vomiting, in some, continued until death closed the scene.

The eyes were affected with a burning heat, often suffused

with tears; the tunica conjunctiva, or white of the eyes, was of a yellowish red colour: the vessels of this tunic were much distended; and the pupils, in some, were dilated. Some, whose pains and heat were very severe, had an appearance on the surface of the body resembling the suffusion of blood, which accompanies the fever preceding the eruption of the confluent small-pox, with petechiæ and ecchymosis, and seemed to arise from the same rapid circulation of the blood in the evanescent arteries, often effusing the blood into the cellular membrane, producing purple spots.

The pulse was commonly full; sometimes hard and accelerated; some few had a small, oppressed pulse; some laboured under great anxiety, restlessness, and jactation. The skin was sometimes dry, but oftener moist. Costiveness often prevailed through the whole of the disease. Some were so insidiously seized, that they were scarcely sensible of their sickness, before they succumbed under the magnitude of the disease.

The blood, as it flowed from the veins, was of a dark purplish colour, similar to blood of drowned or suffocated persons, before respiration is restored. It soon coagulated, and was not sily, and had a shining, greasy appearance on its surface. After a separation of the crassamentum, the serum was yellowish. Only one person, of more than an hundred, who lost blood in the first twenty-four hours after the attack, had sily blood. He had arrived from sea but twenty-four hours before his seizure with the fever. He lost, at three bleedings, near forty-eight ounces of blood, which was florid and sily. After the third bleeding, the pains in his head, back and loins, the burning at the præcordia, the nausea and vomiting, greatly abated; and, after the operation of the cathartic mixture, he retained his mercury. It soon affected his mouth; his distress, anxiety, and jactation vanished, and he was free from fever the fifth day.

Some few, at the first attack, were torpid and drowsy, sensible of little or no pain, with fluid, blackish blood, oozing from their nostrils and mouth; and some discharged urine tinged with blood: but, in general, the urine was little altered from a natural state.

The pain in the head, loins and back, with the hard, full, and accelerated pulse, continued from two to four days, when the pains commonly ceased; the pulse lessened from 110 and 100, to 75, 70, and sometimes to less than 60 in a minute. The extreme heat descended below the natural standard, and, when the disease proved fatal, was succeeded by a coldness of the extremities, a clammy sweat, a low delirium—harbingers of death. The burning at the præcordia, anxiety, distress, and jactation, often continued till death ensued.

The crisis of the fever was on the third, fifth and seventh days in recovery. It terminated fatally on the second, fourth, and sixth days. Only two, of eleven persons who died, survived the sixth day of the disease. The skin, at these stages of the disease, had often a yellowish tinge; and, in some, it had as deep a yellow as a Seville orange: in many, however, it retained its natural colour. The subjects of the disease were the active, athletic, middle aged men; some few women, and scarcely any young children. The appearances of the internal organs, upon opening the bodies of three who died of this fever, have been published in the *Centinel* and *Mercury*, September, 1798.\*

#### METHOD OF CURE.

The young and athletic, at the commencement of the fever, were bled from sixteen ounces to twenty-four; some lost forty-eight ounces of blood, which relieved the pains in the head and back, often suspending the nausea and vomiting.

The pains in the stomach and intestines, the heat at the præcordia, were diminished by liberal evacuations, procured by a solution of Rochelle salts and manna, each two ounces, dissolved in one pint of tamarind-water, and a cupful taken every hour, till liberal evacuations ensued. If the stomach nauseated at this cathartic mixture, clysters were administered, composed of water-gruel, Glauber's salts, castor oil and molasses, which seldom failed lessening the nausea and retching of the stomach.

Sometimes it was necessary to cleanse the stomach, when there was a predominance of acrid bile, by camomile tea or warm water; and to compose the convulsive motions of that organ, after evacuations, with small doses of laudanum liquid in mint tea, or the anti-emetic mixtures, and fomentations of mint and camomile to the region of the stomach. Emetics were dangerous in the inflammatory stage of the fever.

After the intestines were evacuated, two or three grains of calomel were administered every two hours, or every hour, according to the urgency of the symptoms, to excite a salivation; and, upon the appearance of this effect of mercury, the dangerous symptoms vanished.

Scarcely any patient, where the effects of the mercury upon the salivary glands were evident, but what recovered. Sometimes it was necessary to add a small dose of opium to the calomel, to prevent its evacuation by the bowels, and ensure its effects upon the salivary glands.

The salivation was continued until the crisis was accomplished. If the nausea and vomiting could not be allayed, and the mercury was rejected, attempts were made to affect the system and mouth

\* See Medical Repository, vol. ii. p. 249.



by rubbing two drachms of the strong mercurial ointment on the region of the liver, the insides of the thighs and legs, three times a day, until a salivation was excited. During the mercurial course, clysters were administered, to promote a discharge from the bowels: they were a warm fomentation to the contents of the abdomen, and conduced to the ease of the sick in every stage of the disease.

Nothing contributed so much to allay thirst and cool the body as thirty drops of Clutton's febrifuge spirit in cold water, between the doses of calomel: besides being grateful, it composed the jac-tation, and was often sedative at night.

If the respiration was difficult, and the pains in the sides, diaphragm, and mediastinum, were not removed by venesection and cathartic evacuations, large blisters were applied immediately over the affected parts, which often afforded relief, and gave a truce to the disease till the mercury had affected the system.

Blisters also gave the most certain and permanent relief from the pain and inflammation of the cardia, pylorus, and intestines. If delirium supervened, they were applied to the temples and forehead with success, removing the pain and delirium.

In the first stage of the disease, before the application of blisters, every part in pain was frequently washed with cold water and vinegar.

The sick were indulged with cold lemonade, barley-water, with lemon-juice, small-beer, and cider and water. The beverage that was most agreeable to the greatest number of sick, and oftenest retained, was cold water from the well.

The fruits of the season were taken as often as the stomach would admit. New milk, with weak lime-water, was often tried to allay the pungent heat and retching of the stomach, without success.

When the second stage commenced, the morbid action of the system lessened; the pulse lost its frequency and strength; the skin grew cool, much below the healthy standard. Blisters were then applied to the wrists, and inside of the calves of the legs; and bricks, immersed in boiling vinegar, to the insides of the thighs and soles of the feet. The body was encircled with blankets, to diffuse the circulation, and divert the impulse of the fluids from the internal organs to the superficies, and excite a sweat. Warm wine whey, weak warm punch, sage tea, warm chicken broth, and every animating, grateful drink, were given to encourage and support it. In this stage the sick were confined to their beds, and not permitted to rise till the crisis was over. Two persons, who were apparently so far recovered on the sixth day as to be out of danger, arose from their beds, were dressed, and walked through a suite of two rooms, and remained there some

hours, were seized with a faintness and low delirium, which proved fatal to both.

After the subduction of the stimulus of the disease, the heart is scarcely able to propel the blood, in a perpendicular position, to the head; a faintness succeeds; the balance between the heart and circulating mass is lost; and death ensues.

After the crisis the patient returned cautiously to his usual mode of living.

Through the whole of the disease attention was paid to personal cleanliness: the chambers were perfumed, and the purest air that the situation of the sick would admit was indulged.

The fever, in many persons, was not so violent as to require these Herculean remedies, but was cured by a few doses of Rochelle or Glauber's salts, senna and manna, abstinence from animal food, and stimulating liquors; rest, and exciting a gentle perspiration, by free dilution, with any agreeable liquor; lemonade, cold water, and Clutton's febrifuge spirit.

A greater proportion of those who were violently seized with the fever, and early underwent large evacuations by venesection and cathartics, recovered, than of those who were insidiously attacked, and deferred medical aid till the second or third day. Many of those who puked fluid blood, and discharged it from the bowels, recovered. Might not the disease, when seated in the membranes of those organs, have the inflammation removed by the evacuation of fluid blood? But when the disease affected the organs themselves, it proved more refractory, and eluded the efforts of medicine.

I saw no person with carbuncles; a few with petechiæ.

It may be asked, if mercury was so efficacious in this fever, why did so many fall victims to it? It is supposed, that when the disease affected any organ or membranous part, terminating in suppuration, it proved fatal. It has been observed by physicians, that the lesion of an internal organ has frustrated the salutary effects of mercury. Our dissections discovered, in each subject, a lesion of very important organs.

Self-love biasses us in favour of the salubrity of our air and native soil, and gives rise to the opinion, that contagious and epidemic diseases are imported. But it is now almost reduced to a certainty, that the putrid fevers and plagues which raged in Europe, in former centuries, had a domestic origin. I shall recapitulate the causes which gave rise to the fever which prevailed in the summer and fall of 1798, in this town.

#### CAUSES.

1st. The exhalations from the docks, and the sewer that empties itself into the Town Dock.

2dly. The putrid beef and pickled fish that were repacked late in the summer: the semi-putrid salt fish that was thrown into the Mill Creek; and the putrid animal and vegetable substances, uniting with mud in the Town Dock, Green's and Spear's Docks.

3dly. The putrid raw hides and damaged fish in the stores at the foot of Fort-hill.

4thly. The unsalted fish which had been carelessly left in the fish-stall in Liberty-square, till it had attained to the destructive stage of the putrefactive process, and was the cause of the fever and death of Mr. Josiah Bradlee.

5thly. The effluvia from the cellar at the corner of Cross-street; and from the foul and extensive flats and docks from Hancock's-wharf to the Long-wharf.

6thly. The putrid animal and vegetable substances mixing with the mud and filth of the Mill-pond.

7thly. The putrid human ordure, emptied out of the vaults in the night, and which is often scattered over the streets, from the cloacæ to the docks; and from the great number of hogs, kept, through the summer, in narrow and confined yards and pens.

8thly. The carelessness of the inhabitants in permitting the dirt, with putrid meat and fish, to accumulate in their yards; and dead carcasses, fish, &c. to lie in every street in the town during the summer; and vaults overflowing and exposed to the action of the sun.

These causes of disease can be obviated by wise laws, energetically executed.

The causes of the late fever were arrested by the frost: they had not expended their destructive effects; they only are suspended till the heat of the summer shall bring them into operation again.

The evils are incalculable to populous and commercial cities, in the loss of citizens and suspension of commerce during the prevalence of contagious diseases. It, therefore, requires the united efforts of the patriotic, the opulent and wise, in carrying into execution such regulations as may militate with the present interest of some, the prejudice and avarice of others.

I would, therefore, propose, that no beef nor pickled fish be repacked in this town, and that no raw hides be stored in the town, from the first of May till the last of October; that every householder be obliged to clean his yard, and before his house, every other day, during the summer and part of the fall;—and that public carts convey the dirt to some distant part of the town, or by water to some island; and be prohibited, by severe penalties, from throwing any offal of fish, putrid meats, or carcasses of animals, decayed vegetables, or other offensive putrescible substances, into the streets, lanes, or alleys;—that the contents of

no vaults shall be emptied into the docks, nor at the ends of wharves, but shall be conveyed, in large casks, in a public boat, below the Castle, and discharged into the river at the beginning of ebb tide;—that those docks which the water covers but a few hours in the twenty-four be filled up, and all the other docks cleansed, before the last of April, from every substance capable of producing a putrid exhalation;—that no more houses be built in narrow, confined lanes, courts or alleys;—that it be recommended to the inhabitants of this town, to indulge less in animal food and spirituous liquors in the summer and fall than at other seasons of the year, and use a larger proportion of vegetable and farinaceous substances at their meals at those seasons than at others;—that the communication, by drains or pipes, from the vaults of the county prison, and from private houses and stores, into the town or common sewer, be cut off, and the apertures of the sewer be closed by valves that will permit the water to flow off, but prevent the escape of the destructive exhalations from the sewer into the streets;—that no oysters nor clams be permitted to be sold in this town from the first of May till the first of October.

And as it would cut off a source pregnant with evils, it be enjoined upon the fishermen, that they kill their fish, take out their gills and entrails as soon as they are taken, and throw the gills and guts into the river or sea.

Physiologists and epicures know, that the convulsions that precede the lingering death of fish, destroy the firmness of the texture of the fibres, and deprive them of their sweet and luscious taste.

It appears from the returns made to the Selectmen by the physicians, and the undertakers, that there died of this fever, from June 23, 1798, to October 22, *one hundred and forty five persons.*

From the number of families which I usually attend when sick, that moved out of the town, I conjectured nearly eight thousand inhabitants left the town during the sickness.

*January 30, 1799.*

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